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D6.1—1978
D6.1—1984

# MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES

FOR STREETS AND HIGHWAYS

1978

# REVISION NO. 3

SEPTEMBER 1984

U.S. Department of Transportation
**Federal Highway Administration**

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Approved by the Federal Highway Administrator as the National Standard for all Highways open to public travel in accordance with Title 23, U.S. Code, Sections 109(b), 109(d) and 402(a) and 23 CFR 1204.4

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Approved as an American National Standard
by the American National Standards Institute

D6.1–1978 (Supersedes D6.1–1971)

Revisions to this Manual will be published periodically and are available from the Government Printing Office

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TO: Holders of the 1978 Manual on Uniform Traffic Control Devices

SUBJECT: Transmittal of Revision Number 3 of the 1978 Manual on Uniform Traffic Control Devices (MUTCD)

The attached page changes to the 1978 MUTCO incorporate the amendments adopted by the Federal Highway Administrator for inclusion therein. The changes were published in the Federal Register, Volume 48, Number 233, December 2, 1983, and became effective March 1, 1984.

This package includes a complete listing of Official MUTCD Rulings on Interpretations, Changes, and Experimentations made since issuance of the 1978 MUTCD. The previous listing of Official Rulings, furnished with Revision Number 2, should be discarded in its entirety. Most rulings are effective on the action date indicated opposite each ruling. However, some of the rulings include a compliance date by which that revision is to be fully implemented.

Any questions or comments concerning this revision or the MUTCD in general should be sent to: Traffic Control Systems Division (HTO-20), Office of Traffic Operations, Federal Highway Administration, Washington, D.C. 20590.

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## RECORD OF REVISIONS OR ADDITIONS

| REVISION NUMBER | DATE ISSUED | PAGE REVISED OR ADDED |
|---|---|---|
| 1 | 12/79 | 1A-6, 2A-17, 2B-3, 2B-9 2B-19, 2B-24, 2B-26, 2C-8, 2C-9, 2C-13, 2D-18, 2D-20, 2D-21, 2D-22, 2D-24, 2D-26, 2D-27, 2D-28, 2D-29, 2D-30 2F-4, 2E-5, 2E-6, 2E-24, 2F-5, 2F-6, 2F-7, 2F-14, 2F-15, 2F-20, 2F-30, 2F-34, 2F-36, 2F-37, 2F-38, 2F-40, 2F-41, 2F-42, 2F-43, 2F-44, 3B-1, 3B-11, 3B-13, 3B-17, 3B-22, 3B-26, 3D-2, 3D-3, 4B-6, 4B-10, 6B-20, 6B-21, 6B-26, 6B-27 6B-29, 6F-1, 6F-2, 6F-4, 6F-5, 7C-2 7E-2, 8B-3, 9B-1, 9B-4, 9B-9, 9B-10, 9B-13, 9C-4. |
| 2 | 12/83 | iii, IX, XII, XVII, XIX, XX, 1A-3, 1A-4, 1A-5, 1A-6, 1A-7, 1A-8, 2A-3, 2A-4, 2A-6, 2A-7, 2B-3, 2B-29, 2B-30, 2B-33, 2B-34, 2C-2, 2C-2a, 2C-2b, 2C-3, 2C-4, 2C-9, 2C-10, 2D-6, 2D-30, 2D-31, 2D-32, 2E-22, 2E-23, 2E-24, 2E-25, 2F-26, 2F-38, 2F-41, 3B-6, 3C-1, 3C-2, 3C-3, 3C-4, 4B-13, 6B-1, 6B-29, 6E-4, 6E-5, 6E-6, 8B-3, 8B-4, 8B-5, 8B-6, 8B-7, 9B-13, 9B-14, OR-I-1, OR-II-1, OR-II-2, OR-II-3, OR-II-4, OR-II-5, OR-II-6, OR-II-7, OR-II-8, OR-II-9, OR-II-10 OR-II-11, OR-III-1, OR-III-2, OR-VI-1, OR-IV-2, OR-IV-3, OR-IV-4, OR-IV-5, OR-IV-6, OR-IV-7, OR-IV-8, OR-IV-9, OR-IV-10, OR-V1-1, OR-VI-2, OR-V1-3, OR-VIII-1, OR-VIII-2, OR-IX-1 |

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## RECORD OF REVISIONS OR ADDITIONS

| REVISION NUMBER | DATE ISSUED | PAGE REVISED OR ADDED |
|---|---|---|
| 3 | 9/84 | 1A-8, 2A-12, 2A-13, 2A-14, 2A-15, 2A-16, 2A-17, 2A-18, 2A-19, 2B-2, 2B-3, 2B-4, 2B-7, 2B-8, 2B-9, 2B-10, 2B-22, 2B-30, 2B-31, 2B-32, 2B-33, 2B-34, 2C-5, 2C-13, 2D-29, 2D-30, 2D-31, 2D-32, 2D-33, 2D-34, 2D-35, 2D-36, 2E-19, 2E-20, 2E-21, 2E-22, 3B-8, 3B-10, 3B-11, 3B-13, 3B-14, 3B-16, 3B-17, 3B-18 3B-19, 3B-20, 3B-21, 3B-22, 3B-23, 3B-24, 3B-25, 3B-26, 3B-27, 3B-28, 3B-29, 3C-1, 3C-2, 3D-2, 3D-3, 4B-5, 4B-6, 4B-7, 4B-8, 4B-9, 4B-10, 4B-13, 4B-14, 4B-15, 4B-16, 4B-17, 4B-18, 4B-19, 4E-12, 4E-13, 4E-14, 4E-15, 6E-2, 6E-3, 6E-4, 6E-5, 6E-6 7B-5, 7B-6, 7E-2, 7E-3, Complete Table of Contents and Listing of Official Rulings. |

## Listing of Official MUTCD Rulings on Interpretations, Changes and Experimentations

### GENERAL PROVISION

| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| I-1(Chng.) | Legal Authority | Request withdrawn as it involved no substantive change in the MUTCD. The requirement that traffic control devices be placed only under the authority of a public body or official having jurisdiction appeared in Parts II, V, VII, and IX. Although intended that authority for the placement of all traffic control devices be required, no specific reference was included in Parts III, IV, VI and VIII. As an editorial change a consolidated "Placement Authority" Section (1A-3.1) is added in Part I and Sections 2A-3, 5A-2, 7A-8, and 9A-6 are revised to refer to Secion 1A-3.1 for "Placement Authority". | 1/10/83 |
| I-2(Intr.) | Definition of the Term "Roadway" 1A-9 | Unless specifically stated, the term "roadway" within the MUTCD is the same as defined in the Uniform Vehicle Code and the 1971 edition of the MUTCD. The definition of the term "roadway" is added as an editorial change. | 12/6/83 |



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Listing of Official MUTCD Rulings on Interpretations, Changes and Experimentations

SIGNS

| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| II-2(Chng.) | Diesel Fuel Sign<br>2D-46, 2F-33, 2F-34 | Approved the addition to the MUTCD which will provide for the display of diesel fuel in general motorist service signing. A new symbol sign was also approved. | 4/2/78 |
| II-3(Expr.) | Overload Symbol Sign | Symbol Sign to emphasize restricted loading contained too much detail and had vague message. Evaluation of such a sign would be difficult to assess. The request was not approved. | 8/4/78 |
| II-4(Chng.) | Placement of Warning Signs<br>2C-3 | As an aid that should be used with engineering judgement, provides more specific guidance on the placement of warning signs; relating the prevailing speed and conditions to warning sign placement. | 2/9/83 |
| II-6(Chng.) | Signing for Restrooms at Rest Areas<br>2D-42, 2F-35 | Standardized rest area sign to inform approaching motorists of the availability of restrooms was approved. | 9/28/78 |
| II-7(Chng.) | Signing Public Median Crossovers<br>2D-52 | A new section is added to provide more specific guidance on standard signs for inconspicuous public crossovers. | 3/1/84 |
| II-8(Chng.) | Ramp Terminal Destination Signs<br>2D-35 | The three destination limit on ramp signing has been modified to permit four destinations on ramp signing when four destinations are included on the main line. | 9/26/78 |
| II-9(Chng.) | Turn Sign Usage Criteria | This request to delete references to speed when determining whether to use a curve or turn sign was denied. Requester proposed that the arrow should more closely resemble the roadway alignment rather than to indicate the severity of curve. | 9/21/78 |



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| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| II-10(Chng.) | Signing at Signalized Intersections 2B-15, 2B-29 | Provides clarification of sign placement at signalized intersections. | 3/1/84 |
| II-11(Chng.) | Added Lane Symbol Sign 2C-18, 2C-18.1 | A symbol sign was approved that informs motorists on the main roadway as well as those on the ramp that a merging maneuver is not necessary. | 7/19/78 |
| II-12(Chng.) | Channel 9 Monitored Sign 2D-46, 2F-37 | Standardized the sign used to inform motorists that the citizen band emergency channel is being monitored by an official government agency or its designee. | 2/9/83 |
| II-13(Intr.) | Signing for Regional Shopping Centers | Signing for destinations such as regional shopping centers on the Interstate System or other freeways is not in keeping with National MUTCD standard signing principles for such highways. | 8/17/78 |
| II-14(Expr.) | Symbolic No Right (Left) Turn on Red | Approval was given to experiment with a sign depicting the Right (Left) Turn prohibition symbol along with the words on RED. | 12/18/78 |
| II-15(Expr.) | Special Merge Sign | A warning sign indicating MERGE with a downward sloping arrow on a trapezoid for use in a special case of a left-hand on-ramp merge situation was not approved for experimentation. | 8/10/78 |
| II-16(Chng.) | Accessibility to Handicapped Persons for Logo Businesses | A request to establish accessibility to handicapped persons as a criteria for logo signing (motels, restaurants, etc.) was not approved as establishing such criteria for the logo signing program is a State legal matter and the MUTCD requirements cover design of the sign to be used as needed. | 2/9/83 |



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| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| II-17(Expr.) | Sign Legend for Tourist Information Centers | Experimentation approved to determine if there is a detrimental effect in using the term TOURIST as opposed to TRAVELER in conjunction with information centers. | 10/31/78 |
| II-18(Chng.) | Use of Terms Parking, Standing Stopping | A request to add clarifying language on the terms "Parking", "Standing", and "Stopping", each being a progressively more restrictive prohibition, so only one of the three terms need be used on a Parking Prohibition sign was not approved for the following reasons: (1) the MUTCD already permits the use of individual messages on a particular sign; (2) the example in the MUTCD has been modified to illustrate only one of the terms on the sign; and (3) engineers should have the prerogative to use two or three of the terms on a single sign to provide emphasis. | 2/9/83 |
| II-19(Chng.) | Spacing of Chevron Alignment Signs | A request to include a suggested spacing for Chevron Alignment Signs was not approved for the following reasons: (1) this sign should be used for added emphasis to denote the sharpness of a road curve and because of its use in special situations, there must be some flexibility in spacing; and (2) field observations have found that the present MUTCD spacing guide is adequate. | 2/9/83 |



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| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| II-20(Chng.) | Symbol for Police Assistance 2D-46 | Standardizes the sign used for police assistance. | 3/1/84 |
| II-21(Chng.) | Motorcycle and/or Trail Bike Symbol | A request for a uniform motorcycle symbol was not approved for the following reasons: (1) the National Park Service (NPS) has a symbol for motorcycles which is being used nationally; and (2) the NPS symbols are included in the MUTCD by reference. | 2/9/83 |
| II-22(Chng.) | Noise Ordinance Sign | A request for adoption of a national standard for a Noise Ordinance sign was not approved for the following reasons: (1) the Noise Ordinance sign is not an appropriate traffic control device; (2) such a sign is a notification of a blanket regulation and as such is permitted where specific ordinances are enforced; and (3) the general nature of the sign does not identify the noise level limit. | 2/9/83 |



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| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| II-23(Chng.) | Signing for Bypass Lanes | A request for adoption of a national standard for signing bypass lanes was not approved for the following reasons: (1) any paved surface that is improved, designed or ordinarily used for vehicular travel to the right of left turning vehicles may be used by vehicles to bypass the turning vehicles; (2) the extent of bypass lane use across the country does not appear to warrant the establishment of a national standard at this time; (3) several government agencies which have used bypass lanes without special signs have indicated no operational problems; and (4) a bypass lane constructed to relatively high geometric standards would likely cost only slightly less than a design that would provide for a left turn lane. | 2/9/83 |
| II-24(Chng.) | Modified Parking Area Sign Sign | A request for adoption of an additional parking sign consisting of white legend and arrow, and a white and green automobile symbol on a brown background was not approved for the following reasons: (1) the color brown is reserved for use to denote recreational and cultural interest guidance; (2) the proposed sign provides no improvement over the existing standard parking sign; and (3) it would be difficult to discern the message with the color combinations proposed. | 2/9/83 |
| II-25(Expr.) | Overhead Guide Signs | Experimentation approved to evaluate the effectiveness of nonilluminated opaque background overhead guide sign having reflectorized legend and border. Experimentation completed 4/7/81. Non-Illuminated-Opaque Background Overhead Signs proposed as item II-57 (Chng.) | 5/21/79 |





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| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| II-26(Chng.) | Application of Advance Street Name Signs<br>2D-39 | Permits the installation of advance street signs below an intersection related warning sign on intersection approaches, eliminating the need for independent sign supports. | 2/9/83 |
| II-27(Chng.) | Prioritized Listing of Basic Sign Groups<br>2A-4 | Provides guidance for establishing the priority of sign placement in areas where the number of signs that may practically be installed is limited. | 2/9/83 |
| II-28(Chng.) | 911 Emergency Sign | A request to adopt a standard sign to inform the public of the emergency assistance telephone number 911 was not approved for the following reasons: (1) since a motorist seeking aid would have to locate a telephone, the information on emergency assistance could be provided at the telephone; and (2) such signs would detract from essential highway information. | 2/9/83 |
| II-29(Chng.) | Application of Winding Road Sign<br>2C-8 | Permits the use of the Winding Road Sign (W1-5) to warn of a series of three or more curves in lieu of installing a series of Reverse Curve or Reverse Turn signs. | 2/9/83 |
| II-30(Intr.) | Modification of Letter and Numeral Sizes for Substandard Freeways<br>2F-11 | Letters and numerals used on linear parkway guide signs in either urban or rural areas are those specified in Table II-2. In unique and exceptional circumstances waiver of the letter and numeral size requirements of Table II-2 for specified linear parkways may be granted on a section by section basis. | 7/2/81 |



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| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| II-31(Chng.) | Manditory Use of LEFT TURN PROTECTED ON ARROW ONLY Sign (Revised) 28-37 | Provides a standard sign for use at protected/ permitted signalized left turns. A 5-year period for compliance is provided. COMPLIANCE DATE 3/1/89. | 3/1/84 |
| II-32(Intr.) | Use of School Advance Sign and School Speed Limit Sign at Specific Locations | The S4-3 SCHOOL panel is the proper panel to use with the School Speed Limit sign assembly since the use of the Advance School sign would effect an excessive increase in the height of the assembly. This does not preclude the permissive use of the S4-3 SCHOOL panel and the S1-1 School Advance sign in the same general area. | 7/2/81 |
| II-34(Expr.) | High Accident Area Signs | Approval was given to experiment with a series of signs to alert motorists to sections of roadway with a high number of accidents. | 5/25/79 |
| II-35(Intr.) | High Visibility Yellow Traffic Posts | High visibility yellow and other colors are acceptable for small signs supports provided these colors are NOT reflectorized. Color coding of small sign supports is not recommended. The predominant color of delineation reflective units is white or yellow. The mixing of these two predominant colors on a delineator assembly might create confusion to the motorist. Therefore, it is inappropriate to mix these two colors on a delineator assembly. | 7/2/81 |
| II-36(Chng.) | Advance Rest Area Signs 2E-38, 2F-35 | Allows the installation of signs with information on the location of succeeding rest areas. | 2/9/83 |
| II-38(Chng.) | Identifying Left-Hand Exit on Interchange Sequence Signs 2E-34 | Provides a method of identifying left-hand exits on Interchange Sequence signs for urban freeways. | 3/1/84 |



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| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| II-39(Chng.) | Dead End Signs on Intersecting Streets | A request for the development of a standard sign to advise motorists of an intersecting street that dead ends was not approved for the following reasons: (1) existing signs are adequate and can be located such that a motorist on an intersecting street can see these signs before a turn is made into the dead end street; and (2) it would lead to sign proliferation. | 2/9/83 |
| II-40(Intr.) | Use of Light Blue Auxiliary Panels on Appalachian Highway | The use of the legend APPALACHIAN HIGHWAY in white on a light blue background auxiliary panel to supplement the standard black and white route markers for those highways forming the Appalachian Development Highway system was approved as a unique situation which does not have general application. This is applicable solely to the Appalachian Develpment Highway System. The white on light blue auxiliary panels will not be permitted for use on junction assemblies on crossroad approaches to the Appalachian Development Highways. | 7/2/81 |
| II-41(Chng.) | Grooved Pavement Sign | A request to require the use of a GROOVED PAVEMENT advance warning sign was not approved. Use of this sign remains optional. | 2/9/83 |
| II-42(Chng.) | Use of the Color Coral for Mass Transit | A request that the color coral be used for the background of mass transit and park-and-ride facility signs was not approved for the following reasons: (1) mass transit and park-and-ride signs do not represent a sufficiently major group of signs to warrant classification as a unique category of signs; (2) there is insufficient justification for use of a special color; and (3) new standard signing for park-and-ride facilities permits the use of the carpool symbol and bus logo, which provide ready recognition. | 2/9/83 |



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| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| II-43(Chng.) | Anti-Litter Symbol Sign | A request to adopt a national symbol to discourage motorists from littering highways and national parks was not approved for the following reasons: (1) the existing standard signs are sufficient for the needs; and (2) stricter enforcement of State and local statutes would appear to have far greater potential for reducing the litter problem. | 2/9/83 |
| II-44(Chng.) | Addition of Language for Handicapped Parking Sign | A request to adopt a supplemental plate with the legend BY TAG, PERMIT ONLY, or equivalent was not approved as there is a wide variety of regulations governing parking for handicapped persons throughout the country and the MUTCD already permits the use of supplemental plates to accomplish the desired result. | 2/9/83 |
| II-45(Chng.) | School Trip Safety 2B-13, 7B-12, 7E-5, 7E-11 | In school areas, the ENO SCHOOL ZONE sign may be used as an alternate to the Speed Limit sign. Emphasizes the need for protective clothing and devices for school crossing guards and patrols. A 5-year period for compliance is provided. COMPLIANCE DATE 3/1/89. | 3/1/84 |
| II-46(Chng.) | Emergency Medical Services (EMS) Symbol 20-46 | Provides for the "Star of Life" design as the standard symbol for signs providing information for access to the EMS system. | 3/1/84 |
| II-47(Intr.) | Number of Mandatory Advance Guide Signs | Each major and intermediate interchange is required to have an exit direction sign and from one to four advance guide signs depending on interchange spacing, design, and traffic conditions. This does not include any duplicate signs placed on the left side of the roadway or interchange sequence series signs. Since gore signs are not classified as interchange guide signs, they are not included in minimum or maximum requirements. | 7/2/81 |
| II-48(Chng.) | Application of Warrants for STOP Signs | Provides additional emphasis on the need to consider less restrictive traffic control measures prior to the installation of STOP signs. | 3/1/84 |





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| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| II-49(Expr.) | Symbolic Pedestrian Push Button Sign | Approval was given to experiment with a proposed symbolic pedestrian push button sign to determine pedestrian behavior. Experimentation completed 7/21/80, sign proposed as item II-55 (Chng.) | 3/24/80 |
| II-51(Chng.) | Additional Warrants for Multiway STOP Signs | A request for a warrant based on a combination of traffic volume and minimum sight distance at an intersection was not approved as the proposal would promote the excessive use of STOP signs, unnecessarily disrupt traffic flow and contribute to the waste of fuel. | 2/9/83 |
| II-52(Chng.) | Beginning of Pavement Width Transition Sign | A request to include a standard warning sign to mark the physical beginning point of a pavement width transition was not approved as there appears to be no significant problem in pavement width transition signing and the present signing provided in the MUTCD is adequate. | 2/9/83 |
| II-53(Chng.) | Mandatory Movement Sign | A request to provide standard signs for mandatory turning movements at intersections was not approved as they can be adequately signed under the present provisions of the MUTCD. | 2/9/83 |
| II-54(Chng.) | Add Percent Grade Within Hill Sign<br>2C-26 | Permits the display of the percent of grade within the Hill sign (W7-1). | 3/1/84 |
| II-58(Chng.) | Median Mounted One-Way Signs<br>2A-31, 2B-29 | Provides more specific guidance on the placement of one-way signs at intersections with divided highways. A 5-year period for compliance is provided. COMPLIANCE DATE 3/1/89. | 3/1/84 |
| II-59(Chng.) | Temporary Attention Getting Devices | A request to provide for the optional and temporary use of three devices (a sign, flags, or panel) to draw motorist's attention to newly installed traffic controls was not approved as the MUTCD already provides satisfactory means including the [illegible] of flags, for attention-getting. | 2/9/83 |



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| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| II-62(Chng.) | Alternate NEXT RIGHT Legend for ½ Mile Advance Guide Signs | A request to permit the legend NEXT RIGHT (NEXT LEFT) on advance guide signs located ¼ to ½ mile from an exit at major and intermediate interchanges was not approved. The required mileage action message provides superior guidance and the date for compliance; December 31, 1990, provides more than ample time to revise the sign message through normal, routine maintenance at mimimum cost. | 2/9/83 |
| II-63(Chng.) | Use of Chevron Alignment Sign on Conventional Roads 2C-1D | Provides for the use of the Chevron Alignment sign as an alternate to standard delineation treatments. | 3/1/84 |
| II-64(Chng.) | Symbol Sign for NOAA Weather Information | A request to include a symbol sign to identify rest areas having receivers of National Oceanic and Atmospheric Administration (NOAA) Weather Broadcasts was not approved as the proposed symbol does not communicate the intended message as well as the word legend WEATHER INFO already permitted by the MUTCD. | 2/9/83 |
| II-69(Expr.) | Criteria for Gas Logo Signing | Approval was given to experiment with the criteria for the Gas Logo for Specific Service Information Signs. | 12/23/81 |
| II-72(Expr.) | Advisory Speed Sign for GSRS (Grade Severity Rating System) | Approval was given to experiment with a sign to advise trucks of various gross weights of the maximum speed(s) on steep downgrades. | 5/7/82 |
| II-79(Expr.) | Use of Strong Yellow-Green for Emergency Situations | Approval was given to experiment with strong yellow-green as the background color for emergency signs. | 2/18/83 |



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| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| II-82(Intr.) | Positioning of Overhead Lane-Use Control Signs 2B-17, 2B-18, | Lane-use control signs are not designed for, nor are they intended for use adjacent to a signal face. Such use could lead to unnecessary motorists confusion. When the MUTCD refers to overhead positioning of Lane-Use Control signs it means directly above and normally at the beginning of the lane to which it applies, not across the intersection. Lane-Use Control signs shall be used whenever it is desired to require vehicles in certain lanes to turn, or to permit turns from an adjacent lane, except where turning bays, designed so as to not entrap through traffic, are provided and only the auxiliary lane is permitted to turn. | 10/31/83 |
| II-87(Intr.) | Shape of Route Shield on Guide Signs 2D-11, 2E-20, 2F-40 | Where route markers are used as components of guide signs the marker (shield) outline should appear against a background of guide sign face material. The marker (shield) panel can be shaped to the outline of the shield and applied to the guide sign face or the shield may be applied on a square panel for mounting on the guide sign so long as the panel face, outside the shield outline is covered with guide sign face material. | 3/1/84 |



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## Listing of Official MUTCD Rulings on Interpretations, Changes and Experimentations

### MARKINGS

| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| III-1(Expr.) | Use of Single Solid Yellow Centerline in Urban Areas to Restrict But Not Prohibit Crossing | Approval was given to experiment with the use of a single solid yellow centerline in urban areas to restrict but not prohibit crossing. Experimentation completed and terminated | 8/10/73<br>2/14/80. |
| III-4(Chng.) | Reduced Eye Height Dimensions from 3.75 feet to 3.50 feet 3B-5 | Reduces the eye height/object height to 3.50 feet to accommodate the influx of smaller cars in the passenger vehicle fleet. A 5-year period for compliance is provided. COMPLIANCE DATE 3/1/89. | 3/1/84 |
| III-6(Chng.) | Edgeline Requirements for Rural Highways 3B-6 | Requires the use of edgelines on all rural multilane divided highways. COMPLIANCE DATE 1/1/81. | 12/21/78 |
| III-7(Chng.) | Object Markers 3C-1, 3C-2 | A Type 3 object marker is a warning device and should conform to the standard color of black and yellow. A 5-year period for compliance is provided. COMPIANCE DATE 2/9/88. | 2/9/83 |
| III-8(Chng.) | Simplified Pavement Marking Alphabet | A request to approve a simplified pavement marking alphabet was terminated as the requestor did not furnish requested data. | 3/20/80 |
| III-10(Chng.) | Lane Drop Marking 3B-11 | Adopts a special pavement marking pattern for use at lane drops. Use of this pattern is voluntary. | 3/1/84 |
| III-11(Intr.) | Dotted Line Extension at Entrance Ramps | The use of dotted lines through entrance ramps is not inconsistent with the MUTCD. A dotted extension of the right edgeline at entrance ramps is considered an acceptable practice. | 7/12/81 |



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| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| III-14(Chng.) | Marking Bypass Lanes | A request to adopt standard marking patterns for bypass lanes was not approved for the following reasons: (1) the use of bypass lanes nationwide is not considered extensive enough to warrant a national standard; (2) bypass lanes have been used without special markings and without indicated operational problems; and (3) a bypass lane constructed to relatively high geometric standards would likely cost only slightly less than a design that would provide for a left turn lane. | 2/9/83 |
| III-15(Expr.) | No Passing Zone Advance Treatment | Approval was given to experiment with no-passing zone advance treatments. | 5/21/79 |
| III-16(Chng.) | Permissive Use of Wrong-Way Pavement Marking Arrows 2E-41, 3B-11 | The requirement for the use of the Wrong-Way pavement marking arrow is changed to an advisory use. | 2/9/83 |
| III-17(Chng.) | Standard Markings for Angle Parking Spaces | A request that standard marking patterns for angle parking be included in the MUTCD was not approved. | 2/9/83 |
| III-18(Chng.) | Mandatory Marking of Interchange Ramps | Requires the use of channelizing lines and extension of the dashed lines for parallel decleration lanes at exit ramps. | 2/9/83 |
| III-19(Chng.) | Delineator Post Design | Approval was given to experiment with delineator posts utilizng a variety of delineation configurations | 12/20/79 |
| III-20(Chng.) | Pavement Markings for a Standard System of Highway Speed Control | A request to use various pavement marking pattern to indicate speed limits was not approved as being too complicated to implement and too confusing to drivers. | 2/9/83 |



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| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| III-21(Chng.) | Lateral Placement of Delineators 3D-5 | Allows delineators to be placed an additional 2-feet outside the outer edge of the shoulder. | 3/1/84 |
| III-22(Chng.) | Pavement Markings for School Crossing | A request to adopt a proposed symbol as a standard for crossing pavement marking was not approved as it might be confused with other standard symbols and would neither reduce the time or material required for installation nor provide for long wear. | 2/9/83 |
| III-23(Chng.) | Mounting Height of Object Markers 3C-1 | Provides more specific guidance on the placement of object markers. | 3/1/84 |
| III-24(Chng.) | Delineators on Truck Escape Ramps 3D-4 | Establishes red for the color of delineators used to indicate the edge of truck escape ramps. A 5-year period for compliance is provided. COMPLIANCE DATE 3/1/89. | 3/1/84 |
| III-25(Chng.) | Marking of Pedestrian Curb Ramps | A request to adopt national standards regarding color and marking patterns for pedestrian curb ramps was not approved as they are not a traffic control device. | 2/9/83 |





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## Listing of Official MUTCD Rulings on Interpretations, Changes and Experimentations

### SIGNALS

| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| *Sg-96(Chng.) | Pedestrian WALK color 4D-4, 7D-23 | Deletion of the word "lunar" allowing the colors lunar white, clear white, or white to be used for the pedestrian WALK indication was approved. | 2/9/83 |
| *Sg-1D1(Chng.) | Pedestrian YIELD Sign on Signal | Request to change the MUTCD to introduce a yield sign or signal for pedestrians. This request was not approved for the following reasons: (1) no need for such a device has been identified from previous research; (2) no specific detailed device had been presented for consideration. (3) any such device would require changing existing laws in many States. | 6/9/78 |
| *Sg-102(Intr.) | Pedestrian Actuated Control 4C-12(2) | The intent of Section 4C-12(2) is that adequate pedestrian crossing time is needed during the green interval only when the pedestrian movement occurs. Since adequate crossing time is being provided (as a result of a push button activation to extend the green interval) the MUTCD requirements are being met. | 5/18/78 |

* These requests were processed prior to issuance of the 1978 MUTCD and carry request numbers from 1971 Edition of the MUTCD.



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| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| *Sg-103(Intr.) | Marked Crosswalks<br>4D-4(5), 4D-5<br>4D-6 | Request for clarification as to whether marked crosswalks are required whenever pedestrian signals are used. The sections in question refer to either marked or unmarked crosswalks and were not intended in themselves to be a mandate for marked crosswalks where pedestrian signals and detectors are used. Crosswalks are governed by Section 3B-15 which states that "crosswalks should be marked at all intersections where there is substantial conflict between vehicle and pedestrian movements." | 7/27/78 |
| *Sg-104(Chng.) | Pedestrian Indications at Tee-Intersections | A request to change from "shall" to "should" the requirement for a specific indication for pedestrians crossing from the top of the Tee toward the stem, was not approved as the request was not considered proper or reasonable in the safe control of traffic at signalized intersections. | 2/9/83 |
| *Sg-107(Intr.) | Arrow Left Turn Signals | Request on clarification of how an arrow signal face for left turns should be handled under flashing operation. FHWA response noted that the Manual: (1) precludes the darkening of a left-turn signal indications; (2) requires they be flashed CIRCULAR RED or CIRCULAR YELLOW; (3) does not provide for flashing arrow indications. Given these requirements such arrow signal faces must additionally provide for either a flashing CIRCULAR RED or flashing CIRCULAR YELLOW indication and could be handled by (1) a fourth indication (either CIRCULAR RED or CIRCULAR YELLOW); (2) effective substitution of the CIRCULAR RED and CIRCULAR YELLOW indications for the respective arrow indications. | 5/24/78 |

* These requests were processed prior to issuance of the 1978 MUTCD and carry request numbers from 1971 `tion of the MUTCD.



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| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| IV-5/Sg-100 (Chng.) | Use of Steady Flashing Downward Yellow Arrows 4E-8, 4E-9, 4E-10, 4E-12 | Request to change the MUTCD to allow the use of steady and flashing downward YELLOW ARROW lane control signals on freeways to indicate that traffic conditions are congested but closure of the lane is not warranted. The request was denied but with the recommendation that it be resubmitted as a request for experimentation. | 5/25/78 |
| IV-5/Sg-100 (Expr.) | Use of Steady & Flashing Downward Yellow Arrows | The above request resubmitted as a request for experimentation and approved. | 7/11/79 |
| IV-7/Sg-11 (Intr.) | Conflict Between Steady Red Traffic Signal Indications and Flashing Red Railroad Signals | Request as to whether there is a conflict between steady red traffic signal indications and flashing red railroad signals when the intersection and the railroad crossing are in close proximity. There is no conflict in the MUTCD. | 7/2/81 |
| IV-9/Sg-80 (Chng.) | Flashing Red Signals Facing the Median Crossover | A request to allow concurrent display of flashing and steady signal indications with a two-phase traffic signal at a wide median was not approved for the following reasons: (1) where a median is greater than 30 feet in width each roadway is considered a separate intersection for signalization purposes; and (2) degradation of the meaning of a CIRCULAR GREEN Signal indication. | 2/9/83 |
| IV-10/Sg-112 (Chng.) | Prohibit Straight Ahead Green Arrow | A request to prohibit the use of the straight ahead GREEN ARROW was not approved for the following reasons: (1) the straight ahead GREEN ARROW serves a purpose to many complex intersections; (2) the MUTCD does not allow indiscriminate use; (3) prohibiting its use would unnecessarily limit flexibility of control devices. | 2/9/83 |



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| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| IV-11/Sg-113 (Chng.) | Left Turn Lane Signal Displays for Permissive Left Turn | A request to preclude display of the circular green signal to control an exclusive turn lane during intervals when a circular green signal is displayed to oncoming traffic from the opposite direction was not approved as traffic capacity would be unnecessarily reduced. | 2/9/83 |
| IV-13(Chng.) | Dual Circular Indication Traffic Signals on Limited Use Roadways | A request to allow the use of a variable indication signal to display alternately a CIRCULAR GREEN and a CIRCULAR YELLOW indication on limited use roadways was not approved as it would degradate present standards which provide for uniform displays of signal indications to obtain positive response from all drivers. | 2/9/83 |
| IV-16(Intr.) | Signal Display for Exclusive Phase of Turn Signal | Request for an interpretation as to whether the simultaneous display of a CIRCULAR GREEN and a left-turn GREEN ARROW in the same signal head over an exclusive left turn lane is permissible at locations where permissive/protected left-turn phasing is used. The MUTCD allows permissive/protected left/turn phasing to display a CIRCULAR GREEN with a left-turn GREEN ARROW in the signal face that controls left-turn traffic. regardless of the lateral position of the signal faces. | 7/2/81 |
| IV-17(Chng.) | Flashing Signal Display for Fire Preemption | A request to establish a uniform standard for priority control of traffic control signals for fire emergency vehicles was not approved for the following reasons: 1) the MUTCD provides for priority control of traffic signals without unnecessarily limiting the application of controls; 2) sufficient latitude to incorporate local concepts of priority control are presently allowed; 3) adoption of a uniform standard would unnecessarily limit flexibility of priority traffic control device uses. | 2/9/83 |



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| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| IV-18(Chng.) | No Turn on Walk | A request to adopt a "No Turn on Walk" sign at signalized intersections where it is desired to prohibit right turn on red during a signal phase when pedestrians have completed use of the intersection was not approved as it was a duplication of the standard which requires vehicles to yield to pedestrians in a crosswalk. | 2/9/83 |
| IV-19/Sg-68b (Expr.) | Use of Strobe Lights at Railroad Crossings | A request to experiment with strobe-lights attached to cantilevered railroad crossing signals to improve conspicuity and reduce accidents at problem crossings was approved. | 7/10/78 |
| IV-21(Chng.) | Required Locations of Traffic Signals 4B-8, 4B-13 | A request permitting the alternative deployment of signals at intersections by providing for the use of 12-inch lenses in in all signal installations between 120 and 150 feet beyond the stop line in lieu of an additional near-side signal was approved. | 2/9/83 |
| IV-22(Chng.) | Single Portable Traffic Light | A request to provide for use of a single face on a portable mounting for control of traffic through construction and maintenance zones was not approved as the need for two signal faces for each approach to a portable signal in construction and maintenance zones is as critical, if not more so, than it is at regular traffic signals. | 2/9/83 |





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| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| IV-24(Expr.) | Signalization of an Isolated Industrial Driveway | A request to experiment with a traffic signal installation at an industrial driveway with high peak volumes intersecting a major traffic artery was approved. | 9/4/80 |
| IV-26(Expr.) | Evaluation of the Flashing Red Signal Ahead Sign and Flashing Red Strobe Signal | An experimental request to evaluate the effectiveness of the advance warning flashing "RED SIGNAL AHEAD" sign as well as a minor evaluation of the Red Strobe Signal was approved. | 11/25/80 |
| IV-27(Chng.) | Rules for Phasing and Sequencing of Traffic Signals 4B-6, 4B-9, 4B-12, 4B-15, 4B-16, 4B-22 | Sections revised to provide well defined parameters and improved uniformity in the phasing and sequencing of traffic signals. Revision incorporates the results of a comprehensive review of Part 4B. | 3/1/84 |
| IV-29 (Chng.) | Warrants for Freeway Entrance Ramp Control Signals (Interim) 4E-23 | Section revised to shift the terminology emphasis from "warrants" to "guidelines." | 3/1/84 |
| IV-30(Intr.) | Signal Operation Must Relate to Traffic Flow 4B-20 | The word "shall" in Section 4B-20 is a mandatory requirement. The term "traffic requirements" relates to such factors as vehicular volumes, speeds, pedestrian volumes, etc. The Engineering data which should be updated and evaluated is the data needed to develop the new phasing and timing plan. The term "regularly" means a frequency based on engineering judgement, with which traffic characteristics change to the extent that new phasing and timing plans need to be considered. | 5/5/81 |
| IV-31(Chng.) | Periodic Darkening of Hazard Identification Beacons | A request to modify Section 4B-19 to clarify guidelines for periodic darkening of Hazard Identification Beacons was was not approved as the present intent of this section is to preclude darkening of only traffic control signals. | 2/9/83 |



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| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| IV-32(Chng.) | Flashing Operation of Newly Installed Traffic Signals | A request to provide for the flashing of a new traffic control signal during a period prior to stop and go operation was not approved as not an appropriate MUTCD requirement but considered good practice. | 2/9/83 |
| IV-33(Chng.) | Lane-Use Control Signals | Request withdrawn as it is an editorial change which cross-references two requirements of the MUTCD concerning the use of markings and overhead signals on reversible lanes (Sec. 3B-12, 4E-8). | 2/9/83 |
| IV-35(Intr.) | Pedestrian Clearance Interval Calculation | Request pertained to Section 4D-7 and whether or not the vehicle clearance interval following flashing DONT WALK can be considered as part of the pedestrian clearance interval, even though the DONT WALK is not flashing. The calculation of the amount of clearance interval (flashing DONT WALK) provided for pedestrians can consider the vehicle clearance interval as part of the time provided for pedestrian clearance even though the steady DONT WALK is displayed during the vehicle clearance interval. Discretion should be used in utilizing the latitude afforded by Section 4D-7. | 7/23/81 |
| IV-37(Expr.) | Flashing Yellow Permisive Turn Indication | A request to evaluate the use of protected/permitted (flashing YELLOW) left-turn phasing was approved. This experimentation substitutes a CIRCULAR GREEN with a flashing YELLOW display during the permitted portion of a left-turn phase in an exclusive left-turn signal. | 6/21/82 |
| IV-37a(Expr.) | Flashing Yellow Turn Indication | This request is a similar experimentation as IV-37 and was approved. | 2/8/83 |



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| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| IV-41(Intr.) | Traffic Signal Display at Tee-Intersections | A request on the question of what is considered an appropriate display to meet the requirement of Section 4B-12(1) for an intersection approach which has a very predominate left-turn movement. The requirement for a minimum of two signal faces for the through traffic movement applies to what ever traffic movement is determined to be predominant. Thus, signal head displays should be selected to accommodate this predominate movement since the term "through movement" is not necessarily synonymous with "Straight Ahead" but could be interpreted to indicate there could be other types of through traffic, such as through turning left or right. | 12/31/81 |
| IV-46(Intr.) | Simultaneous Display of Circular Red and Green Arrow | For protected/permitted left-turn phasing the simultaneous display of a CIRCULAR RED and GREEN ARROW on the same signal face is not only considered proper, but it is required that the signals in the left-turn lane display have a CIRCULAR RED indication when a CIRCULAR RED indication is displayed in the other two signal faces. This is required regardless of whether a GREEN ARROW, YELLOW ARROW, or no arrow is displayed on the signal confusion from such displays can be minimized by selecting display and installation arrangements that emphasize the shared function of such signals. | 3/30/83 |



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Listing of Official MUTCO Rulings on Interpretations,

Changes and Experimentations

CONSTRUCTION AND MAINTENANCE

| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| VI-2(Chng.) | Minimum Reflectivity Requirements | A request to specify Type III Sheeting as the minimum standard for the level of reflectivity of traffic control devices in work zones was not approved as the type of sheeting now commonly used (Type II) is satisfactory, less expensive, and there have been no reflectivity problems identified with its use. | 2/9/83 |
| VI-4(Chng.) | Shoulder Drop-Off Sign 6B-33 | A symbol sign depicting a shoulder drop off was approved as an alternate to the word message sign (W8-9) LOW SHOULDER. | 7/19/78 |
| VI-5(Expr.) | Experimentation with Work Zone Traffic Control Devices | Approval was given to determine the effectiveness of selected barricades and channelizing devices and which elicits the most favorable driver response. | 9/20/78 |
| VI-6(Chng.) | Detour Design Criteria | A request to include design criteria for detours was not approved as appropriate for the MUTCD. Guidelines have been incorporated into the Traffic Control Devices Handbook. | 2/9/83 |
| VI-7(Chng.) | Maintained Visibility Level for Channelizing Devices | A request to require specific reflectorization or illumination of traffic control devices in work zones was not approved as being too subjective, difficult to measure and enforce. | 2/9/83 |
| VI-8(Chng.) | Orange Stop Ahead and Yield Ahead Symbol Signs | A request that these symbol signs, when installed in construction and maintenance areas, not have an orange background because of the poor contrast with red symbols, was not approved. Identifying the work area with the orange background is significantly important and the use of word legends is still acceptable. | 2/9/83 |



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| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| VI-9(Chng.) | Prohibit Use of Metal Drums | A request that the use of metal drums be prohibited was not approved for the following reasons: (1) metal drums are used extensively without noted problems; (2) prohibition of the use of metal drums is a local option since the MUTCD does not mandate their use; and (3) there are many other devices available for use in lieu of metal drums. | 2/9/83 |
| VI-10(Chng.) | Use of Yellow Background Signs in Work Zones | A request to require work zone warning signs to have a yellow background was not approved for the following reasons: (1) when the color orange was adopted, it was recognized that the color contrast would not be as good; however the benefit to the motorist in being able to associate the color orange with work zones outweighed the poorer color contrast; and (2) where the black on orange color contrast is considered to be a problem, a more highly reflective material may be used. | 2/9/83 |
| VI-11(Chng.) | Reflectorization of Signs 2A-18, 6B-2 | A request requiring that reflectorizing material, other than buttons or similar units, to have a smooth sealed outer surface was approved. A 5-year period for compliance is provided. COMPLIANCE DATE 2/9/88. | 2/9/83 |
| VI-12(Chng.) | Color of Reflectorized Material for Cones 6C-3 | A change specifying white bands as the color of reflectorized material for cones and tubular markers, was approved. A 3-year period for compliance is provided. COMPLIANCE DATE 2/9/86. | 2/9/83 |
| VI-13(Chng.) | Advance Warning Flashing Arrow Panels 6E-7, 6E-8, 6E-9 | Definition of the proper use of arrow panels and criteria for their use was approved. | 2/9/83 |



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| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| VI-15(Chng.) | Use of Street Name Signs With Detour Signs 6B-38 | Recommended use of Street Name signs with Detour signs was approved. | 2/9/83 |
| VI-16(Chng.) | Use of DETOUR ENDS Signs 6B-38 | Recommended use of a DETOUR ENDS sign to provide improved guidance to motorists along detours was approved. | 2/9/83 |
| VI-17(Chng.) | Simulated Drums | A request to permit the use of simulated drums as an alternative to standard channelizing devices was not approved for the following reasons: (1) simulated drums are a nonstandard version of a vertical panel; (2) a sufficient variety of devices for channelizing in work zones are already permitted; and (3) simulated drums do not look as formidable as drums and, persumably would not be as effective. | 3/1/84 |
| VI-18(Chng.) | Standards for Flashing and Steady Burn Warning Lights 6E-5 | Provides that new flashing and steady burn warning lights are obtained based upon a purchase specification, and that existing devices perform based upon a field performance specification using distance and visibility criteria. | 3/1/84 |
| VI-19(Intr.) | Use of 30-Gallon Drums | The height requirement of "approximately" 36 inches for drums set on end and used for traffic warning or channelizing in construction and maintenance work areas does not permit the use of 30-gallon drums as traffic control devices. | 7/2/81 |



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Listing of Official MUTCD Rulings on Interpretations,

Changes and Experimentations

RAILROAD-HIGHWAY GRADE CROSSINGS

| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| VIII-1(Chng.) | Lateral Clearance for Flashing Light Signals and Gates | A request to establish greater lateral clearance for railroad crossing signal supports was not approved as it would: (1) require an increase in length of gate arms; (2) increase the need for cantilever gate arms or the potential for train/vehicle collisions; and (3) require increased maintenance effort for alignment of flashing light signals. | 2/9/83 |
| VIII-2(Chng.) | Warning Signs on Roads Parallel to Railroads 8B-3 | The addition of standard signs for warning motorists on roads parallel to railroads was approved. A 5-year compliance period is provided. COMPLIANCE DATE 2/9/88. | 2/9/83 |
| VIII-4(Chng.) | Railroad Advance Warning Sign Depicting Angle of Crossing | A request to adopt a railroad advance warning sign depicting the angle of crossing was terminated as the requester did not furnish requested data. | 5/29/83 |
| VIII-5(Chng.) | Use of STOP signs at Railroad-Highway Grade Crossings 2B-5, 8B-9 | A change providing for the use of STOP signs at railroad-highway grade crossings, only where the need for the signs has been determined by a detailed traffic engineering study was approved. | 2/9/83 |
| VIII-6(Chng.) | Details on Railroad Bells | A request to include specifications for the use of bells at railroad-highway grade crossings was not approved as it is not appropriate for inclusion in the MUTCD. | 2/9/83 |
| VIII-7(Chng.) | Required Use of Crossbucks on Bikeways | A request to require at least one crossbuck sign on each bikeway approach to a grade crossing was not approved as such installation should be determined by engineering judgement and not required. | 2/9/83 |



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| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| VIII-9(Chng.) | Elevation of Top of Foundation for Flashing Lights and Gates | A request to delete the requirement that the top of the foundation for flashing light signal and gate supports be at the same elevation as the crown of the roadway was not approved as the benefits achieved from standardizing support post lengths outweigh the potential benefits of eliminating the elevation requirement. | 2/9/83 |



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## Listing of Official MUTCD Rulings on Interpretations, Changes and Experimentations

## BICYCLE FACILITIES

| Number | Title/Section | Ruling | Action Date |
|---|---|---|---|
| IX-1(Chng.) | Symbol Sign for Interstate Bike Routes 9B-21 | A route marker was approved for use on bicycle routes that extend for long distances in two or more States. | 7/26/78 |
| IX-2(Chng.) | Bike Parking Sign 9B-23 | A standard sign to designate bicycle parking areas was approved. | 2/9/83 |
| IX-3(Chng.) | Hostel Sign | A symbol sign closely resembling the Camping/Picnicking sign to provide guidance to hostels was not approved for use as a national standard. Sign was reconsidered and not approved for the following reasons: (1) there is little demonstrated need for such signing; (2) other means are available to get such information to bicyclists and other non-motorists; and (3) similarity with the picnicking sign could create confusion. | 9/12/78<br>2/9/83 |



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To the extent they are incorporated by specific reference, the following documents are made a part of this Manual:

Standard Alphabets for Highway Signs and Pavement Markings—Federal Highway Administration, 1977 Edition

Standard Color Tolerance Charts—Federal Highway Administration, 1970

Standard Highway Signs Booklet—Federal Highway Administration, 1979 Edition

Adjustable Face Vehicle Traffic Control Signal Head Standards—Institute of Transportation Engineers, 1970

Adjustable Face Pedestrain Signal Head Revised Standards—Institute of Transportation Engineers, 1975

National Standards for Specific Information Signs—Federal Highway Administration, 1979 (Federal-Aid Highway Program Manual 6-8-3-8)

Standard for Flashing and Steady Burn Barricade Warning Lights—Institute of Transportation Engineers, 1977

Standard for Traffic Signal Lamps—Institute of Transportation Engineers, 1967

Other documents that are useful sources of information with respect to utilization of these standards include:

Transportation and Traffic Engineering Handbook—Institute of Transportation Engineers, 1976

Highway Capacity Manual—Transportation Research Board, 1965

A Policy on Geometric Design of Rural Highways—American Association of State Highway and Transportation Officials, 1965

A Policy on Design of Urban Highway, and Arterial Streets—American Association of State Highway and Transportation Officials, 1973

Manual on Traffic Engineering Studies—Institute of Transportation Engineers, 1976

Volume 12, Highway Safety Program Manual, Highway Design, Construction, and Maintenance—Federal Highway Administration

Volume 13, Highway Safety Program Manual, Traffic Engineering Services—Federal Highway Administration

Traffic Control Devices Handbook; and Operating Guide—Federal Highway Administration, 1975

### 1A-8 Color Code

The following color code establishes general meaning for eight colors in a total of twelve colors that have been identified as being appropriate for use in conveying traffic control information. Central values and tolerance limits for each color are available. *

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The four colors for which no meaning has been assigned are being reserved for future applications. The meanings described in this Section are of a general nature. More specific assignments of colors are given in the individual Parts of this Manual relating to each class of devices.

Color Code:
YELLOW—General Warning.
RED—Stop or prohibition.
BLUE—Motorist Services guidance.
GREEN—Indicated movements permitted, direction guidance.
BROWN—Recreational and cultural interest guidance.
ORANGE—Construction and maintenance warning.
BLACK—Regulation.
WHITE—Regulation.
PURPLE—Unassigned.
STRONG YELLOW—GREEN—Unassigned.
LIGHT BLUE—Unassigned.
CORAL—Unassigned.

### 1A-9 Definitions of Words and Phrases

Unless otherwise defined herein, definitions contained in the most recent editions of the Uniform Vehicle Code, AASHTO Highway Definitions, and other documents specified in section 1A-7 are also incorporated and adopted by reference.

Unless otherwise defined herein, the term "roadway" shall be defined as: "That portion of a highway improved, designed, or ordinarily used for vehicular travel, exclusive of the berm or shoulder. In the event a highway includes two or more separate roadways, the term 'roadway' as used herein, refers to any such roadway separately, but not to all such roads collectively."

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* Available from the Federal Highway Administration, (HTO-20), Washington, D.C. 20590.

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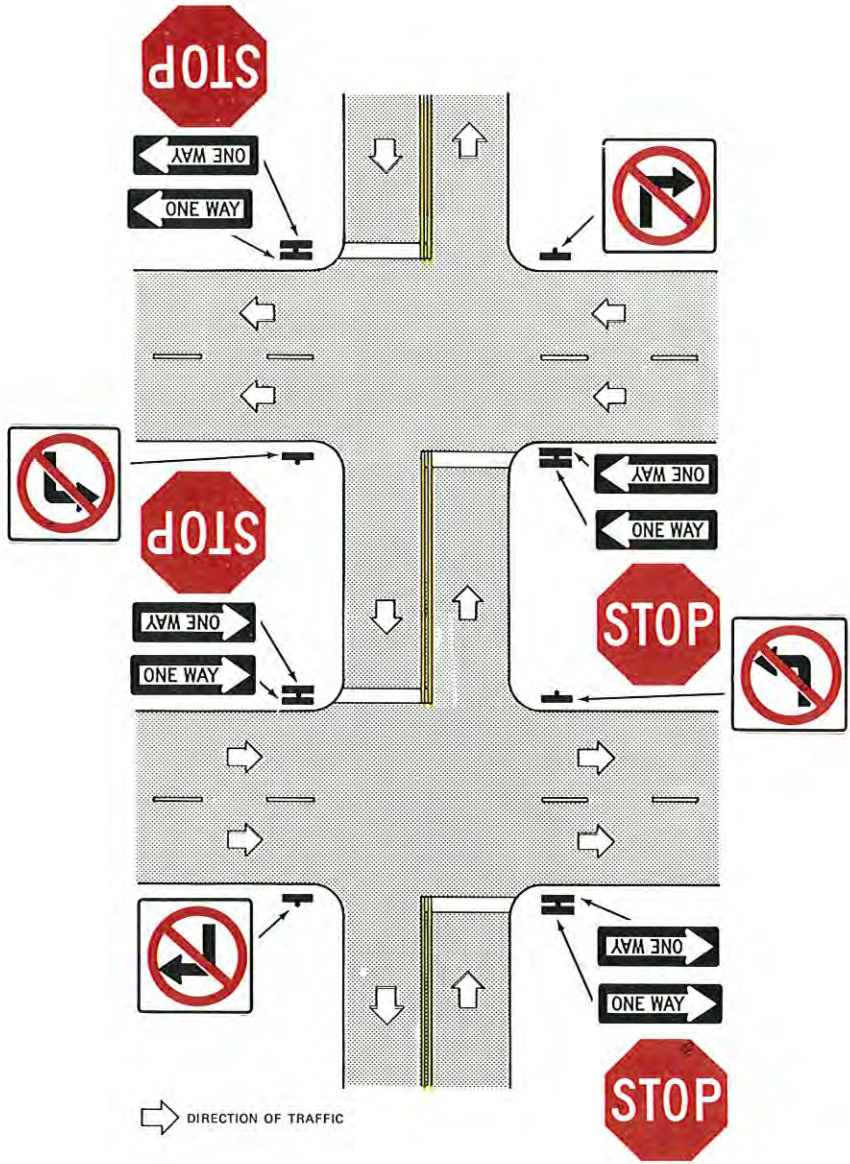


*Figure 2-3. Location of one-way and turn prohibition signs.*

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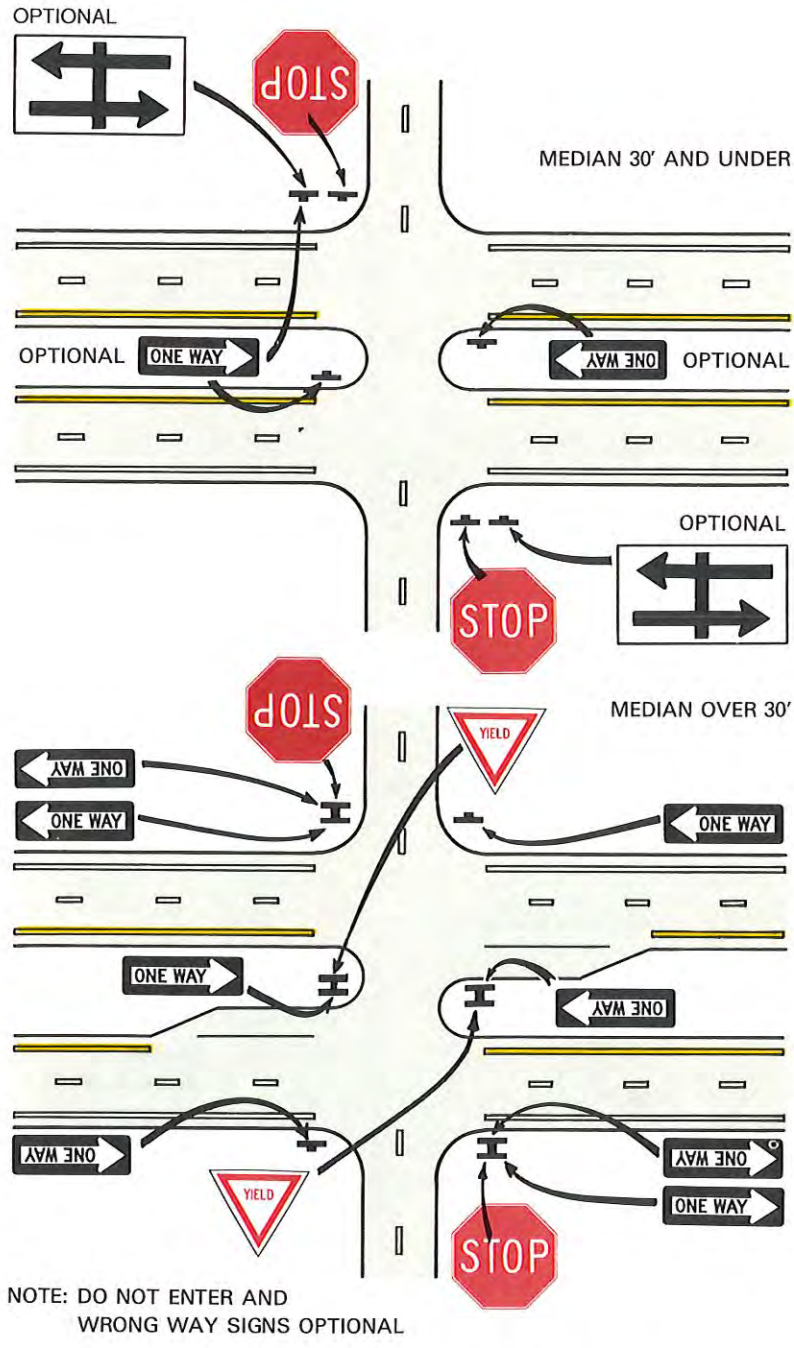


*Figure 2-3a. Alternate one way signing for divided highways*

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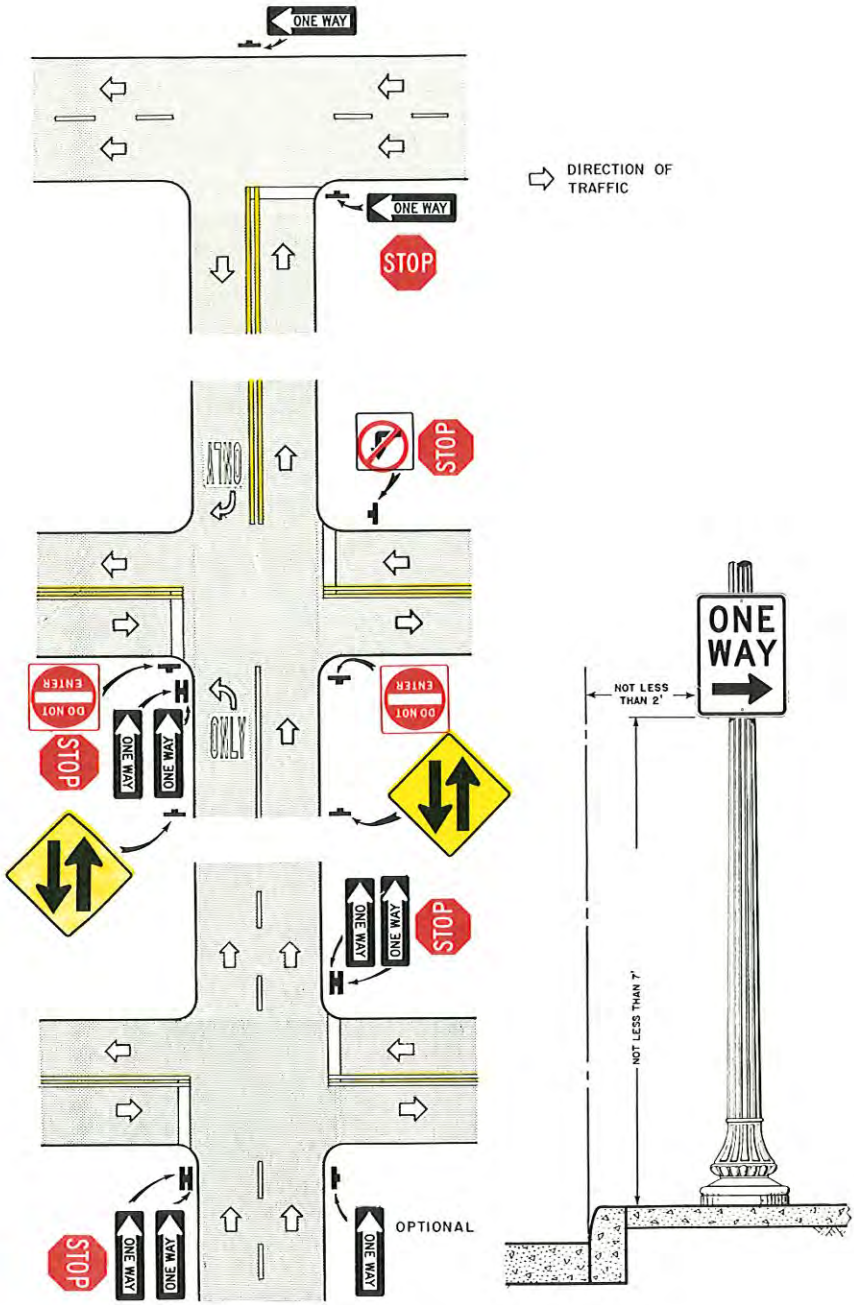


*Figure 2-4. Typical location of one-way signs.*

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## 2A-22 Overhead Sign Installations

The operational requirements of our present highway system are such that overhead signs will have value at many locations. The factors justifying the erection of overhead sign displays are not definable in specific numerical terms, but the following conditions deserve consideration:

1. Traffic volume at or near capacity
2. Complex interchange design
3. Three or more lanes in each direction
4. Restricted sight distance
5. Closely spaced interchanges
6. Multi-lane exits
7. Large percentage of trucks
8. Street lighting background
9. High speed traffic
10. Consistency of sign message location through a series of interchanges
11. Insufficient space for ground mounted signs
12. Junction of an Interstate route with another freeway
13. Left exit ramps

The existence of any one or more of the conditions listed does not automatically justify the use of overhead signs. Some of the elements listed above can be made less critical by close coordination between design and operation.

## 2A-23 Height

Signs erected at the side of the road in rural districts shall be mounted at a height of at least 5 feet, measured from the bottom of the sign to the near edge of the pavement. In business, commercial and residential districts where parking and/or pedestrian movement is likely to occur or where there are other obstructions to view, the clearance to the bottom of the sign shall be at least 7 feet. The height to the bottom of a secondary sign mounted below another sign may be 1 foot less than the appropriate height specified above.

The height requirements for ground installations on expressways vary somewhat from those on conventional streets and highways. Directional signs on expressways shall be erected with a minimum height of 7 feet (from the level of the near edge of the pavement to the bottom of the sign). If, however, a secondary sign is mounted below another sign, the major sign shall be at least 8 feet and the secondary sign at least 5 feet above the level of the pavement edge. All route markers and warning and regulatory signs on expressways shall be at least 6 feet above the level of the pavement edge. However, where signs are placed 30 feet or more from the edge of the nearest traffic lane for increased roadside

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safety, the height to the bottom of such signs may be 5 feet above the level of the pavement edge.

A route marking assembly consisting of a route marker with an auxiliary plate (sec. 2D-10) is treated as a single sign for the purposes of this section.

Overhead signs shall provide a vertical clearance of not less than 17 feet over the entire width of the pavement and shoulders except where a lesser vertical clearance is used for the design of other structures. The vertical clearance to overhead sign structures or supports need not be greater than 1 foot in excess of the minimum design clearance of other structures. In special cases it may be necessary to reduce the clearance still further because of substandard dimensions in tunnels and other major structures such as double-deck bridges.

### 2A-24 Lateral Clearance

Signs should have the maximum practical lateral clearance from the edge of the traveled way for the safety of motorists who may leave the roadway and strike the sign supports. Advantage should be taken of existing guardrail, overcrossing structures and other conditions to minimize the exposure of sign supports to traffic. Otherwise, breakaway or yielding supports should be used.

Normally, signs should not be closer than 6 feet from the edge of the shoulder, or if none, 12 feet from the edge of the traveled way. In urban areas a lesser clearance may be used where necessary. Although 2 feet is recommended as a working urban minimum, a clearance of 1 foot from the curb face is permissible where sidewalk width is limited or where existing poles are close to the curb.

The minimum clearance outside the usable roadway shoulder for expressway signs mounted at the roadside or for overhead sign supports, either to the right or left side of the roadway, shall be 6 feet. This minimum clearance of 6 feet shall also apply outside of an unmountable curb. Where practicable, a sign should not be less than 10 feet from the edge of the nearest traffic lane. Large guide signs especially should be farther removed, preferably 30 feet or more from the nearest traffic lane. Lesser clearances, but not generally less than 6 feet, may be used on connecting roadways or ramps at interchanges.

Where an expressway median is 12 feet or less in width, consideration should be given to spanning both roadways without a center support. Butterfly-type signs and other overhead sign supports should not be erected in gores or other exposed locations. Where overhead sign supports cannot be placed a safe distance away from the line of traffic, or in an otherwise protected site, they should either be so designed as to minimize the impact forces, or otherwise protect motorists adequately by a physical barrier or guardrail of suitable design.

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### 2A-25 Position of Signs

A warning sign is placed in advance of the condition to which it calls attention (fig. 2-5, page 2A-17). A regulatory sign normally is placed where its mandate or prohibition applies or begins. Guide signs are placed, where needed, to keep drivers well informed as to the route to their destination. Figures 2-7a, 7b, 7c (pages 2D-16 to 2D-18) show the placement of intersection guide signs on other than expressways. Detailed specifications for sign locations are given in the sections of the Manual dealing with an individual sign or classes of signs.

### 2A-26 Erection

Normally, signs should be mounted approximately at right angles to the direction of, and facing, the traffic that they are intended to serve.

Where mirror reflection from the sign face is encountered in such degree as to reduce legibility, the sign should be turned slightly away from the road. When signs are offset 30 feet or more from the pavement edge, signs should generally be turned toward the road. At curved alignments, the angle of placement should be determined by the course of approaching traffic rather than by the roadway edge at the point where the sign is located. Sign faces normally are vertical, but on grades it may be desirable to tilt a sign forward or back from the vertical to improve the viewing angle.

### 2A-27 Posts and Mountings

Sign posts and their foundations and sign mountings shall be so constructed as to hold signs in a proper and permanent position, to resist swaying in the wind or displacement by vandalism.

In areas where ground mounted sign supports cannot be sufficiently offset (sec. 2A-24) from the pavement edge, sign supports should be of a suitable breakaway or yielding design. Concrete bases for sign supports should be flush with the ground level.

In some cases, especially in urban districts, signs can be correctly placed on existing supports used for other purposes, such as traffic signals, street lights, and public utility poles where permitted, thereby saving expense and minimizing sidewalk obstruction.

### 2A-28 Bridges for Sign Supports

Overcrossing structures many times can serve for the support of overhead signs, and under some circumstances, may be the only practical solution that will provide adequate viewing distance. Use of such structures as sign supports will eliminate the need for the foundations and sign supports along the roadside. On urban freeways and expressways where overhead crossings are closely spaced, it is desirable to place signs on bridges to enhance safety and economy.

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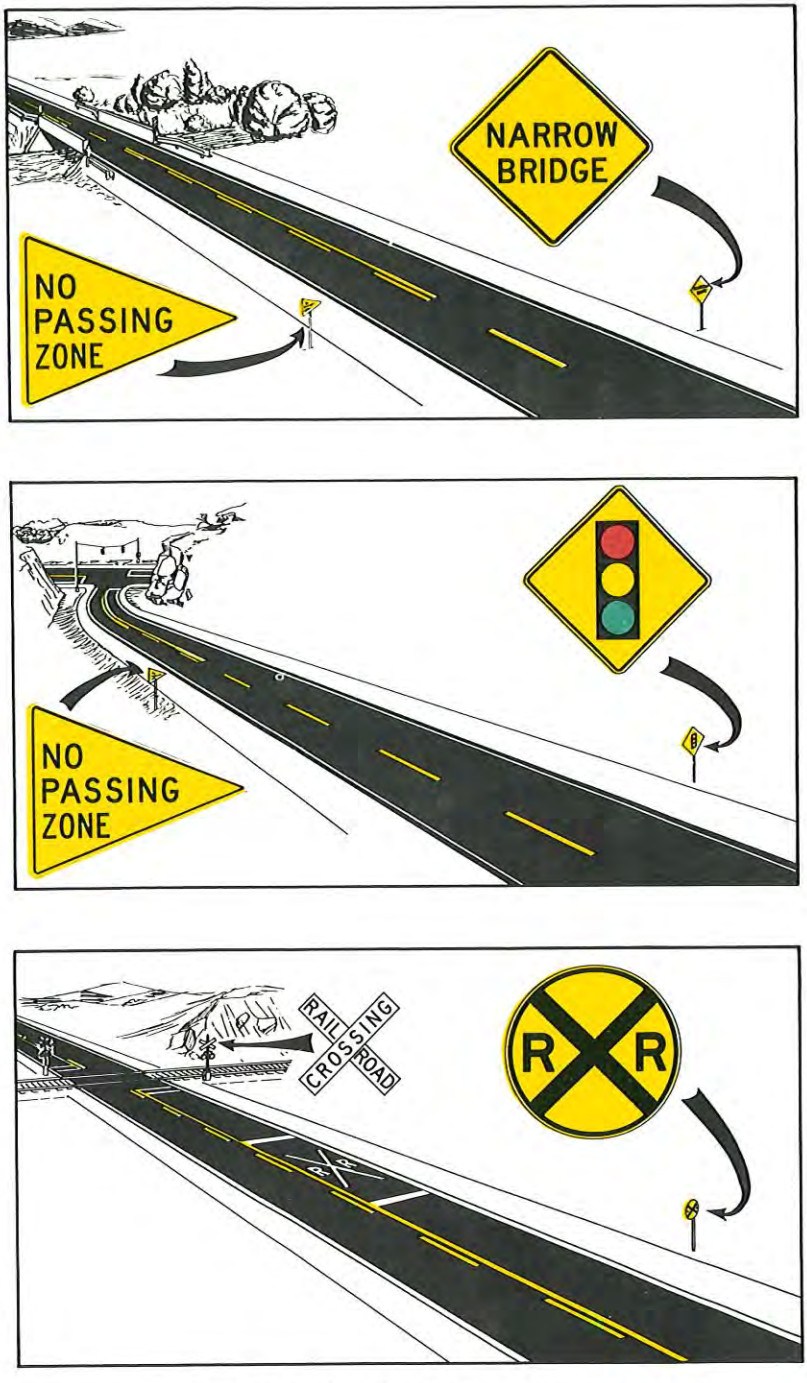


*Figure 2–5. Typical applications of warning signs.*

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### 2A-29 Sign Materials

A variety of materials can be used effectively. However, it is recognized that technological progress may develop new and satisfactory or superior materials for highway signs, particularly in the fields of illumination and reflectorization. Nothing in this Manual should be interpreted to exclude any new material that meets the standard requirements for color and legibility, both by day and by night.

### 2A-30 Maintenance

All traffic signs should be kept in proper position, clean and legible at all times. Damaged signs should be replaced without undue delay.

To assure adequate maintenance, a suitable schedule for inspection, cleaning and replacement of signs should be established. Employees of street and highway organizations, police and other governmental employees whose duties require that they travel on the highways should be encouraged to report any damaged or obscured signs at the first opportunity.

Special attention and necessary action should be taken to see that weeds, trees, shrubbery and construction materials do not obscure the face of any sign.

A regular schedule of replacement of lighting elements for illuminated signs should be maintained.

### 2A-31 Wrong-Way Traffic Control

Efforts should be made to identify and make practical corrections at grade intersections on divided highways where wrong-way usage is being experienced or where a wide median, a rural unlighted environment or other contributing factors indicate the likelihood of wrong-way movements.

Where roadways are separated by median widths of 30 feet or more, the intersections with the crossroad shall be signed as two separate intersections and ONE WAY signs (Section 2B-29) should be visible to each crossroad approach on the near right-hand and far left-hand corners of each intersection with the directional roadways as shown in Figure 2-3. However, when an engineering study has demonstrated that placement of ONE WAY signs in the median area may create confusion, the near right-hand signs in the median may be omitted and ONE WAY signs placed in the far right quadrant of the intersection. Figure 2-3a shows that alternate signing scheme with one sign omitted from the median. The ONE WAY signs may be supplemented by a Turn Prohibition sign or by DO NOT ENTER or WRONG WAY signs. II-58 (c) Rev. 3

For median widths of less than 30 feet, the use of the ONE WAY signs at the intersection is optional. As an alternative, the use of the R6-3 Divided Highway Crossing sign may be considered.

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If used, DO NOT ENTER and WRONG WAY signs should be placed on a divided highway at a location to be directly in view of a driver making a wrong-way entry from the crossroad. Additional signs may be placed where the median width is 30 feet or more.

Standard directional arrow pavement markings may be placed in each approach lane of each roadway in advance of a grade intersection and at other selected locations to indicate the direction of traffic flow.

At locations which are determined to have a special need, other standard warning or prohibitive methods and devices may be used as a deterrent to the wrong-way movement (Ref. sec. 2E–41).

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## B. REGULATORY SIGNS

### 2B-1 Application of Regulatory Signs

Regulatory signs inform highway users of traffic laws or regulations and indicate the applicability of legal requirements that would not otherwise be apparent. These signs shall be erected wherever needed to fulfill this purpose, but unnecessary mandates should be avoided. The laws of many States specify that certain regulations are enforceable only when made known by official signs.

Some regulatory signs are related to operational controls but do not impose any obligations or prohibitions. For example, signs giving advance notice of or marking the end of a restricted zone are included in the regulatory group.

Regulatory signs normally shall be erected at those locations where regulations apply. The sign message shall clearly indicate the requirements imposed by the regulation and shall be easily visible and legible to the vehicle operator.

### 2B-2 Classification of Regulatory Signs

Regulatory signs are classified in the following groups:

1. Right-of-way series:
   (a) STOP sign (sec. 2B-4 to 6)
   (b) YIELD sign (sec. 2B-7 to 9)
2. Speed series (sec. 2B-10 to 14)
3. Movement series:
   (a) Turning (sec. 2B-15 to 19)
   (b) Alignment (sec. 2B-20 to 25)
   (c) Exclusion (sec. 2B-26 to 28)
   (d) One Way (sec. 2B-29 to 30)
4. Parking series (sec. 2B-31 to 34)
5. Pedestrian series (sec. 2B-35 to 36)
6. Miscellaneous series (sec. 2B-37 to 44)

### 2B-3 Design of Regulatory Signs

Regulatory signs are rectangular, with the longer dimension vertical, and have black legend on a white background, except for those signs whose standards specify otherwise.

All regulatory signs shall be reflectorized or illuminated to show the same shape and color both by day and by night, unless excepted in the standards covering a particular sign or group of signs.

For use of educational plaques with symbol signs see section 2A-13.

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R1–1
30″ x 30″

R1–3
12″ x 6″

R1–4
18″ x 6″

**2B–4 Stop Sign (R1–1)**

STOP signs are intended for use where traffic is required to stop. The STOP sign shall be an octagon with white message and border on a red background. The standard size shall be 30 × 30 inches. Where greater emphasis or visibility is required, a larger size is recommended. On low-volume local streets and secondary roads with low approach speeds, a 24 × 24 inch size may be used.

At a multiway stop intersection (sec. 2B–6), a supplementary plate (R1–3) should be mounted just below each STOP sign. If the number of approach legs to the intersection is three or more, the numeral on the supplementary plate shall correspond to the actual number of legs, or the legend ALL-WAY (R1–4) may be used. The supplementary plate shall have white letters on a red background and shall have a standard size of 12 × 6 inches (R1–3) or 18 × 6 inches (R1–4).

A STOP sign beacon or beacons may be used in conjunction with a STOP sign as described in section 4E–4.

Secondary messages shall not be used on STOP sign faces.

**2B–5 Warrants for Stop Sign**

Because the STOP sign causes a substantial inconvenience to motorists, it should be used only where warranted. A STOP sign may be warranted at an intersection where one or more of the following conditions exist:

1. Intersection of a less important road with a main road where application of the normal right-of-way rule is unduly hazardous.
2. Street entering a through highway or street.
3. Unsignalized intersection in a signalized area.
4. Other intersections where a combination of high speed, restricted view, and serious accident record indicates a need for control by the STOP sign.

Prior to the application of these warrants, consideration should be given to less restrictive measures, such as the YIELD sign (2B–7) where a full

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stop is not necessary at all times. Periodic reviews of existing installations may be desirable to determine whether, because of changed conditions, the use of less restrictive control or no control could accommodate traffic demands safely and more effectively. II-48 (c) Rev. 3

STOP signs should never be used on the through roadways of expressways. Properly designed expressway interchanges provide for the continuous flow of traffic, making STOP signs unnessary even on the entering roadways. Where at-grade intersections are temporarily justified for local traffic in sparsely populated areas, STOP signs should be used on the entering roadways to protect the through traffic. STOP signs may also be required at the end of diverging roadways at the intersection with other highways not designed as expressways. In most of these cases, the speeds will not warrant any great increase in the sign sizes.

STOP signs shall not be erected at intersections where traffic control signals are operating. The conflicting commands of two types of control devices are confusing. If traffic is required to stop when the operation of the stop-and-go signals is not warranted, the signals should be put on flashing operation with the red flashing light facing the traffic that must stop.

Where two main highways intersect, the STOP sign or signs should normally be posted on the minor street to stop the lesser flow of traffic. Traffic engineering studies, however, may justify a decision to install a STOP sign or signs on the major street, as at a three-way intersection where safety considerations may justify stopping the greater flow of traffic to permit a left-turning movement.

STOP signs may be used at selected railroad-highway grade crossings only after their need has been determined by a detailed traffic engineering study. Use of the STOP sign at railroad-highway grade crossings is described in Section 8B-9. VIII-5 Rev. 2

Portable or part-time STOP signs shall not be used except for emergency purposes. Also, STOP signs should not be used for speed control.

### 2B-6 Multiway Stop Signs

The "Multiway Stop" installation is useful as a safety measure at some locations. It should ordinarily be used only where the volume of traffic on the intersecting roads is approximately equal. A traffic control signal is more satisfactory for an intersection with a heavy volume of traffic.

Any of the following conditions may warrant a multiway STOP sign installation (sec. 2B-4):

1. Where traffic signals are warranted and urgently needed, the multiway stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the signal installation.

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2. An accident problem, as indicated by five or more reported accidents of a type susceptible of correction by a multiway stop installation in a 12-month period. Such accidents include right- and left-turn collisions as well as right-angle collisions.

3. Minimum traffic volumes:
   (a) The total vehicular volume entering the intersection from all approaches must average at least 500 vehicles per hour for any 8 hours of an average day, and
   (b) The combined vehicular and pedestrian volume from the minor street or highway must average at least 200 units per hour for the same 8 hours, with an average delay to minor street vehicular traffic of at least 30 seconds per vehicle during the maximum hour, but
   (c) When the 85-percentile approach speed of the major street traffic exceeds 40 miles per hour, the minimum vehicular volume warrant is 70 percent of the above requirements.

## 2B-7 Yield Sign (R1-2)

The YIELD sign assigns right-of-way to traffic on certain approaches to an intersection. Vehicles controlled by a YIELD sign need stop only when necessary to avoid interference with other traffic that is given the right-of-way.

The YIELD sign shall be a downward pointing, equilateral triangle having a red border band and a white interior and the word YIELD in red inside the border band. The standard size shall be 36 × 36 × 36 inches.

R1–2
36" x 36" x 36"

## 2B-8 Warrants for Yield Signs

The YIELD sign may be warranted:

1. On a minor road at the entrance to an intersection where it is necessary to assign right-of-way to the major road, but where a stop is not necessary at all times, and where the safe approach speed on the minor road exceeds 10 miles per hour.

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message or on a separate plate (R2-2). When used independently, the Truck Speed sign should carry a reference to SPEED or MPH.

Minimum speeds shall be displayed only in combination with the posted speed limit (sec. 2B-12).

Advisory Speed signs are treated under section 2C-35.

The standard Speed Limit sign shall be 24 × 30 inches. On expressways the sign should be at least 36 × 48 inches, with 48 × 60 inches prescribed for use on freeways.

### 2B-11 Night Speed Sign (R2-3)

Where different speed limits are prescribed for day and night, both the limits shall be posted. This may be done in either of two ways:

1. Immediately below the standard Speed Limit sign (R2-1) or combined with it, a Night Speed sign (R2-3) carrying the legend NIGHT 45 (or other suitable numerical limit) may be erected. In this case the numerals in the Night Speed sign and only the words SPEED LIMIT in the standard sign, should be reflectorized. As a special but logical exception to the general color scheme, the Night Speed sign should have its legend in white upon a black background.

2. A changeable message sign may be used, so that only the appropriate regulation is visible at a given time. The sign may have interchangeable panels, or reflectorization of the nighttime speed superimposed over the unreflectorized numerals of the daytime speed, to permit only the nighttime speed to become legible in the beam of motor-vehicle headlamps at night.

R2-3
24" x 24"

### 2B-12 Minimum Speed Sign (R2-4)

Where an engineering and traffic investigation shows that slow speeds on a highway consistently impede the normal and reasonable movement of traffic, signs may be used to post a minimum legal speed. Driving slower than the minimum limit is illegal except when necessary for safe operation or in compliance with the law. The minimum speed shall be displayed only in combination with the posted speed limit, and if desired, these two signs may be combined (R2-4a). The Minimum Speed sign shall have a standard, and minimum, size of 24 × 30 inches.

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R2–4
24" x 30"

R2–4a
24" x 48"

### 2B–13 Location of Speed Limit Sign

Speed Limit signs, indicating speed limits for which posting is required by law, shall be located at the points of change from one speed limit to another. These signs shall not be erected until the speed limits are approved and officially authorized.

At the end of the section to which a speed limit applies, a Speed Limit sign showing the next speed limit shall be erected. Additional signs shall be installed beyond major intersections and at other locations where it is necessary to remind motorists of the limit that is applicable. In school areas, the END SCHOOL ZONE sign may be used as an alternate to the Speed Limit Sign. II-45 (c) Rev. 3

The Speed Zone Ahead sign (sec. 2B–14) may be used to give advance notice of a speed zone with a lower limit.

In rural districts on U.S. and other State numbered routes, Speed Limit signs indicating the statutory speed limits shall be erected at entrances to the State and at boundaries of metropolitan areas. A special oversize sign is often desirable at these locations.

### 2B–14 Sign for Reduced Speed Ahead (R2–5)

This sign should be used in rural areas to inform the motorist of a reduced speed zone when an advance notice is needed to comply with the speed limit posted ahead. The sign is not ordinarily needed in urban areas where speeds are relatively low.

This sign shall always be followed by a Speed Limit sign erected at the beginning of the zone where the altered speed limit applies.

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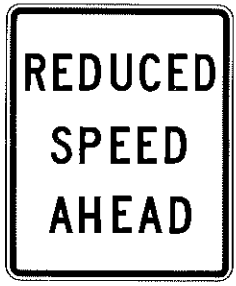
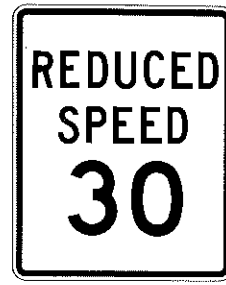
This sign shall have a standard size of 24 × 30 inches. It shall, however, be of the same size as the Speed Limit sign at the beginning of the speed zone, shall be erected in the same manner, and shall display one of the three illustrated legends.




R2–5a
24" x 30"




R2–5b
24" x 30"

R2–5c
24" x 30"

**2B–15 Turn Prohibition Signs (R3–1 to 3)**

Turn Prohibition signs should be used to indicate the turns that are prohibited or restricted at a particular intersection.

The standard, and minimum, size of the No Right Turn sign (R3–1), the No Left Turn sign (R3–2), and the NO TURNS sign (R3–3) shall be 24 × 24 inches.

Turn Prohibition signs should be placed where they will be most easily seen by drivers intending to turn. Where No Right Turn signs are needed, at least one should be placed either over the roadway or at a right-hand corner of the intersection. If signals are present, the sign may be installed adjacent to a signal face viewed by motorists in the right lane.

Where No Left Turn signs are needed, at least one should be placed over the roadway or at a left-hand corner of the intersection. If signals are present, the sign may be installed adjacent to a signal face viewed by motorists in the left lane. Where No Turns signs are needed, two signs should be used, one at a location specified for a No Right Turn sign and one at a location specified for a No Left Turn sign. If signals are present, a No Turns sign may be placed adjacent to a signal face viewed by all motorists on that approach. II-10 (c) Rev. 3

If advance signs are used, care should be taken that no alley or public driveway exists between them and the intersection where the turning movement is prohibited. At an intersection where one or more approaches to the intersection are limited to one-way traffic, whether signalized or not, the ONE WAY sign (sec. 2B–29) shall be used, and may be supplemented by the Turn Prohibition sign (fig. 2–3, page 2A–11). A Turn Prohibition sign is not needed at a ramp entrance to an expressway where the design is such as to indicate clearly the one-way traffic movement on

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the ramp. The DO NOT ENTER sign (sec. 2B-26) will serve in lieu of the Turn Prohibition sign where it is necessary to emphasize the one-way traffic movement on the ramp.

When the movement restriction applies during certain periods only, the use of Turn Prohibition signs calls for special treatment. The following alternatives are listed in order of preference:

1. Variable message signs or internally illuminated signs that are lighted and made legible only during the restricted hours, particularly desirable at signalized intersections.

2. Permanently mounted signs incorporating a supplementary legend showing the hours during which the prohibition is applicable.

3. Portable signs off the roadway at each corner of the intersection where required, put in place under police supervision only when applicable and removed at other hours.

The appropriate word message, NO RIGHT TURN or NO LEFT TURN, on a 24 x 30 inch panel may be used as an alternate.

R3-1
24" x 24"

R3-3
24" x 24"

**2B-16 U-Turn Prohibition Sign (R3-4)**

The U-Turn Prohibition sign is intended for use at or between intersections to indicate locations where U turns are prohibited. The sign shall have a standardized size of 24 × 24 inches.

R3-4
24" x 24"

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TOR-DRIVEN CYCLES PROHIBITED (R5-10a) or PEDESTRIANS AND BICYCLES PROHIBITED (R5-10b).

R5-3
24″×24″

R5-6
24″ x 24″

R5-10c
24″×12″

R9-3a
18″×18″

R5-10a
30″×36″

R5-10b
30″×18″

If an exclusion is to be governed by vehicle weight, a Weight Limit sign (sec. 2B-41) rather than an Exclusion sign should be used.

Because of the variety of possible messages for these signs, it is not practicable to fix standard sizes for them as a class. In all cases the lettering should be large enough to give adequate legibility. They should be conspicuously placed at all entrances to the restricted roadway.

The Exclusion sign should be placed on the right-hand side of the roadway approximately 25 feet from the intersection so as to be clearly

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visible to all drivers and others turning into the roadway which has the exclusion. A supplementary sign may be necessary on the left-hand side of the restricted roadway.

A PEDESTRIAN PROHIBITED sign (R5-10c) should be used at interchanges or elsewhere where pedestrians can enter the expressway right-of-way and endanger themselves or others, particularly where they attempt to cross the roadways. The sign may also be used at underpasses or elsewhere where safe pedestrian facilities are not provided. The sign should be erected wherever it can be most effective. Because of the length of the words constituting its legend, a 24 × 12 inch horizontal panel is warranted.

### 2B-29 One Way Sign (R6-1, R6-2)

The ONE WAY sign shall be used when required to indicate streets or roadways upon which vehicular traffic is allowed to travel in one direction only. The sign shall be either (a) a white arrow, right or left, on black horizontal rectangle of a standard, and minimum, size of 36 × 12 inches with the words ONE WAY centered in the arrow (R6-1); or (b) a vertical rectangle of a standard, and minimum, size of 18 × 24 inches with black lettering and a right or left arrow on a white background (R6-2). The vertical design has advantages where lateral space is limited.

One Way signs shall be placed on the near right-hand and the far left-hand corners of the intersection at nonsignalized intersections so as to face traffic entering or crossing the one-way street (Figure 2-3, page 2A-11), except that intersections of divided highways with median widths of 30 feet or more may be signed as in Section 2A-31. Where the intersection is signalized, the signs shall be placed either near the appropriate signal faces or at the locations specified for nonsignalized intersections. One Way signs should also be placed parallel to the one-way street directly opposite the exits from alleys and other public ways. A One Way sign should always be used, where applicable, and may be supplemented by a Turn Prohibited sign (sec. 2B-15).

II-10 (c)
II-58 (c)
Rev. 3

R6-1
36" x 12"

R6-2
18" x 24"

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sidewalks are provided. This sign shall be in only one standard size of 18 × 24 inches, and need not be reflectorized. It should be erected on the right-hand side of the road where pedestrians must walk on the pavement or road shoulder in the absence of pedestrian pathways or sidewalks.

The No Hitchhiking sign may be used to post prohibition against standing in the roadway for the purpose of soliciting a ride. It may be erected at locations where hitchhiking has been observed contrary to law. The R9-4 word message sign may be used as an alternate to the R9-4a symbol sign.

R9–1
18″ x 24″

R9–4
18″ x 24″

R9-4a
18″ × 18″

## 2B-36 Pedestrian Crossing Signs (R9-2, R9-3)

Pedestrian Crossing signs may be used selectively to aid in limiting pedestrian crossing to safe places. They will ordinarily be required only in urban areas and, when used, shall be erected to face the traffic for which they are intended. The messages shown are typical. These signs need not be reflectorized.

The CROSS ONLY AT CROSS WALKS sign (R9-2) may be used, where crosswalks are clearly defined, to discourage jay-walking or unauthorized crossing.

The No Pedestrian Crossing sign may be used to prohibit pedestrians from crossing a roadway at a point which is considered to be hazardous, especially in front of a school or other public building where a crossing is not designated. The R9-3 word message sign may be used as an alternate to the R9-3a symbol sign. Supplemental black on white panel R9-3b (R or L), USE CROSSWALK with an arrow, may be used below either sign to designate the direction of the crossing. When R9-3b is used, the educational plaque for R9-3a should be deleted.

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R9–2
12″ x 18″

R9–3a
18″×18″

R9–3b
18″×12″

**2B–37 Traffic Signal Signs (R10–1 to 11)**

To supplement traffic signal control, auxiliary signs of the type illustrated are often desirable or necessary for the instruction of pedestrians and drivers. Signal instruction signs should be located adjacent to the signal face to which they apply.

Among the traffic signal instruction signs applicable to pedestrians are signs R10–1, 2, 3, and 4. These signs need not be reflectorized.

Permissible as an alternate message for the Pedestrian Actuated Signal sign (R10–3, R10–4) is the legend TO CROSS STREET (arrow) PUSH BUTTON WAIT FOR GREEN (WALK) SIGNAL (R10–3a, R10–4a).

The Pedestrian Actuated Signal sign should be 9 × 12 inches in size and shall be mounted immediately above or incorporated in the pedestrian push-button unit (sec. 4D–6).

Signal instruction signs may be needed at certain locations to clarify signal control. Among the legends for this purpose are LEFT ON ARROW ONLY (R10–5), LEFT TURN YIELD ON GREEN (symbolic green ball) (R10–12), or LEFT (RIGHT) TURN SIGNAL (R10–10) for compliance with certain turn signals, STOP HERE ON RED (R10–6) for observance of signal limit lines, DO NOT BLOCK INTERSECTION (R10–7) for avoidance of traffic obstructions, and USE LANE(S) WITH GREEN ARROW (R10–8) for obedience to lane-direction control signals. II-31 (c) Rev. 3

The NO TURN ON RED sign (R10–11a, 11b) shall be used to indicate that a right turn on red (or left turn on red for one-way streets) is not permitted. For part time prohibitions see section 2B–15. The NO TURN ON RED sign should have standard dimensions of 24 × 30 inches and 24 × 24 inches for R10–11a and R10–11b, respectively. The sign should be erected near the appropriate signal head.

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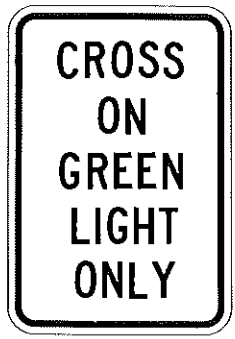
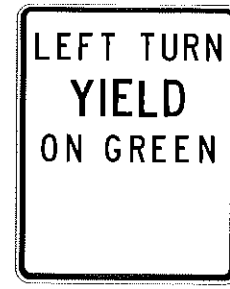
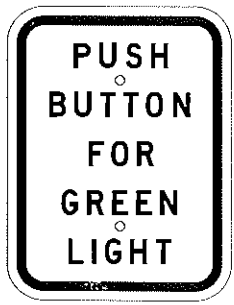



R10–1
12" x 18"

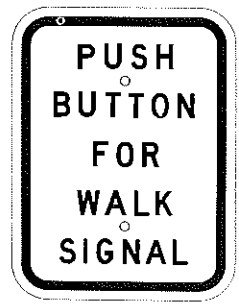
R10–2
12" x 18"



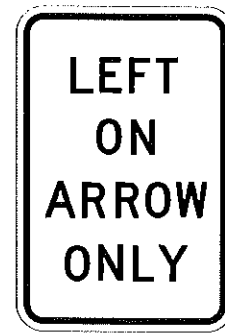

R10-12
24" x 30"




R10–3
9" x 12"




R10–4
9" x 12"




R10–5
12" x 18"

A NO TURN ON RED sign may be considered whenever an engineering study finds that one or more of the following conditions exist:

1. Sight distance to vehicles approaching from the left (or right, if applicable) is inadequate.
2. The intersection area has geometrics or operational characteristics which may result in unexpected conflicts.
3. There is an exclusive pedestrian phase.
4. Significant pedestrian conflicts are resulting from RTOR maneuvers.
5. More than three RTOR accidents per year have been identified for the particular approach.
6. There is significant crossing activity by children, elderly, or handicapped people.

Where improved utilization of progressive signal systems is desired, the Traffic Signal Speed sign (sec. 2D–48) should be used.

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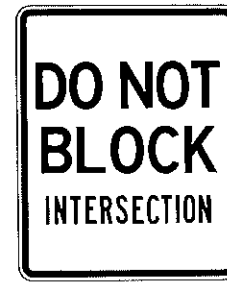
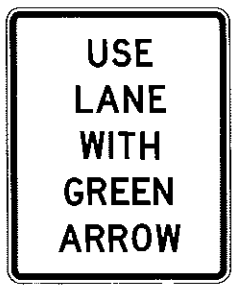
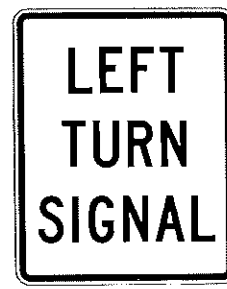
R10–6
24″ x 36″



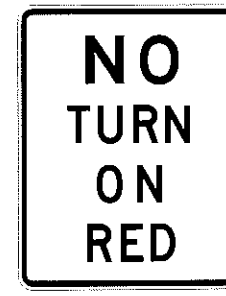

R10–7
24″ x 30″




R10–8
24″ x 30″




R10–10
24″ x 30″




R10-11a
24″×30″

**2B–38 Keep Off Median Sign (R11–1)**

The Keep Off Median sign is intended for use where driving into or parking on the median is prohibited.

The KEEP OFF MEDIAN sign shall have a standard, and mimimum, size of 24 × 30 inches. On expressways it should be at least 36 × 48 inches, with 48 × 60 inches prescribed for freeways.

The sign should be erected on the left of the roadway within the median wherever there is a tendency for drivers to enter or cross and at random intervals as needed.

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R11–1
24" x 30"

R11–2
48" x 30"

### 2B-39 Road Closed Sign (R11-2)

The ROAD CLOSED sign should be used to mark roads that have been closed to all traffic (except authorized vehicles) because of a temporary emergency. It should not be used where traffic is maintained or where a route is detoured several miles in advance of the actual construction or blockade. In the latter case the Local Traffic Only sign (sec. 2B-40) should be used.

The Road Closed sign shall have a standard, and minimum, size of 48 × 30 inches.

Where the sign faces through traffic, it shall be preceded by an Advance Road Closed warning sign (sec. 6B-17) and, if applicable, an Advance Detour warning sign (sec. 6B-16).

### 2B-40 Local Traffic Only Sign (R11-3, R11-4)

The Local Traffic Only sign should be used where through traffic must detour to avoid a closing of the highway for construction or maintenance work (Part VI), or for a temporary emergency some distance beyond, but where the highway is open for traffic up to the point of closure. It shall carry the legend ROAD CLOSED (10) MILES AHEAD—LOCAL TRAFFIC ONLY, or optionally for urban application, ROAD CLOSED TO THRU TRAFFIC. Both signs shall be designed as horizontal rectangles.

The words BRIDGE OUT (or similar message) may be substituted for ROAD CLOSED where applicable. Where the sign faces through traffic, it shall be preceded by an Advance Road Closed warning sign (sec. 6B-17) with the secondary legend AHEAD and, if applicable, an Advance Detour warning sign (sec. 6B-16).

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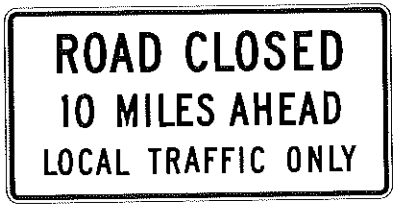


R11-3
60" x 30"

R11-4
60" x 30"

## 2B-41 Weight Limit Signs (R12-1 to 5)

Due to seasonal weakening of the road surface, obsolescence of bridges or pavements, or other impairment of roadways, it is often necessary to limit the load permitted on a roadway.

The Weight Limit sign (R12-1) carrying the legend WEIGHT LIMIT (10) TONS, may be used to indicate restrictions pertaining to total vehicle weight including load.

Where the restriction applies to axle weight rather than gross load, the legend may be AXLE WEIGHT LIMIT (5) TONS (R12-2).

In residential districts, where it is intended to restrict trucks of certain sizes by reference to empty weight, the legend may read NO TRUCKS OVER 7000 LBS EMPTY WT (R12-3).

In areas where multiple regulations of the type described above are applicable, a sign combining the necessary messages on a single panel may be used, such as WEIGHT LIMIT (2) TONS PER AXLE (10) TONS GROSS (R12-4).

Posting of specific load limits may be accomplished by use of the Weight Limit symbol sign (R12-5). This sign contains the legend WEIGHT LIMIT on the top two lines and shows three different truck symbols with the allowable weight limit shown to the right of each symbol as ( ) T. A bottom line of legend stating GROSS WT is permissible if needed for enforcement purposes. Only the truck symbols and their respective weight limits for which restrictions apply need be shown.

A Weight Limit sign shall be located immediately in advance of the section of highway or the structure to which it applies. The standard, and minimum, size shall be 24 × 30 inches but a larger size is desirable on major roads and streets.

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A Large Arrow sign is intended to be used to give notice of a sharp change of alignment in the direction of travel. It is not to be used where there is no change in the direction of travel (ends of medians, center piers, etc.).

The Large Arrow sign, when used, shall be erected on the outside of a curve or on the far side of an intersection, in line with, and at right angles to, approaching traffic.

To be effective the Large Arrow sign should be visible for at least 500 feet and trial runs by day and night may be desirable to determine final positioning.

W1–6
48" x 24"

W1–7
48" x 24"

## 2C–10 Chevron Alignment Sign (W1-8)

The Chevron Alignment sign shall be a vertical rectangle with a minimum size of 12 inches by 18 inches. It shall have a yellow background with chevron symbol in black. The size of sign used will be determined by an engineering investigation.

A Chevron Alignment sign may be used as an alternate or supplement to standard delineators and to the Large Arrow sign. The Chevron Alignment sign is intended to be used to give notice of a sharp change of alignment with the direction of travel. Chevron Alignment sign is intended to provide additional emphasis and guidance for vehicle operators as to changes in horizontal alignment of the roadway.

II-63 (c) Rev. 3

W1-8
18"×24"

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Chevron Alignment signs, when used, are erected on the outside of a curve, sharp turn, or on the far side of an intersection, in line with and at right angles to approaching traffic. Spacing of the signs should be such that the motorists always have two in view, until the change in alignment eliminates the need for the signs. To be effective, Chevron Alignment signs should be visible for at least 500 feet; trial runs by day and night may be desirable to determine final positioning.

### 2C-11 Cross Road Sign (W2-1)

The Cross Road sign is intended for use on a through highway to indicate the presence of an obscured crossroad intersection. It is not ordinarily used where Junction signing (secs. 2D-14, 2D-29) or advance route turn assembly signs (sec. 2D-30) are present.

The relative importance of the intersecting roads may be shown by different widths of line in the diagram.

The diagram for a crossroad intersection with a slight offset should indicate that the side roads are not opposite each other. If the crossroad occurs in the vicinity of a curve the symbol may be modified appropriately.

W2-1
30" x 30"

### 2C-12 Side Road Sign (W2-2, W2-3)

The Side Road sign, showing a side-road symbol, either left or right, and at an angle of either 90 or 45 degrees, is intended for use in advance of a side-road intersection according to the same warrants as set forth for the Cross Road sign (sec. 2C-11).

The relative importance of the intersecting roads may be shown by different widths of line in the diagram. If the side road occurs in the vicinity of a curve the symbol may be modified appropriately.

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## 2C-26 Hill Sign (W7-1 to 4)

The Hill sign (W7-1) is intended for use in advance of a downgrade where the length, percent of grade, horizontal curvature, or other physical features require special precautions on the part of drivers. When the percent grade is shown within the Hill sign (W7-1) the message X% shall be placed below the inclined ramp/truck symbol. The word message HILL (W7-1a) may be used as an alternate legend.

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W7-1
30" x 30"

W7-1a
30"×30"

The Hill (W7-1) and Grade (W7-3) signs should be used in advance of downgrades for the following conditions:

5% grade and more than 3,000 feet long
6% grade and more than 2,000 feet long
7% grade and more than 1,000 feet long
8% grade and more than 750 feet long
9% grade and more than 500 feet long

These signs should also be installed for steeper grades or where accident experience and field observations indicate a need.

The supplemental plaques (W7-2 series, W7-3 series) or other appropriate legends and larger signs should be used for emphasis or where special hill characteristics exist. On longer grades, the use of the mileage plaque (W7-3a or W7-3b) at periodic intervals of approximately 1 mile spacing should be considered.

W7-2b
24"×18"

W7-3
24"×18"

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W7-3a
24″×18″

W7-3b
24″×18″

Runaway truck ramps are desirable for the safe deceleration and stopping of runaway vehicles on long, steep downgrades where installation is practical. When such ramps are installed, the associated signing (W7-4, W7-4a) shall be black on yellow with the message "Runaway Truck Ramp." A supplemental panel may be used with the words "Sand," "Gravel," or "Paved" to describe the ramp surface. These advance warning signs should be located in advance of the gore approximately one mile, one-half mile, and then one at the gore. A regulatory sign near the entrance should be used containing the message "Runaway Vehicles Only" to discourage other motorists from entering the ramp. No Parking signs may be placed as required near the ramp entrance.

W7-4
78″×48″

W7-4a
78″×60″

Some hills have potentially hazardous conditions such as a stop condition, railroad grade crossing, sharp curvature or a community that may not be readily apparent to an unfamilar driver. A truck turnout at the hill crest and a special trucker information diagrammatic sign may be necessary for these situations.

### 2C-27 Bump and Dip Signs (W8-1, W8-2)

These signs are intended for use to give warning of a sharp rise or depression in the profile of the road that is sufficiently abrupt to create

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The standard installation for Weigh Stations shall include three basic signs:

1. Advance sign (D8-1)
2. Exit Direction sign (D8-2)
3. Gore sign (D8-3)

The location of these signs is shown in figure 2-8. Where State law requires a regulatory sign in advance of the Weigh Station, a fourth sign (sec. 2B-42) may be located following the Advance sign. Design details for these signs are included in Standard Highway Signs. *

The Exit Direction sign (D8-2) or the Advance sign (D8-1) should display, either within the sign border or on a supplemental panel, the changeable message OPEN or CLOSED. Remote control of the changeable message is recommended, but provision may be made for changing the message manually.

**2D-46 General Service Signs (D9-1 to 14)** | II-20 (c) Rev. 3

On conventional highways commercial services such as gas, food and lodging are generally within sight and available to the traveler at reasonably frequent intervals along the route. Consequently, there is not expected to be much need on this class of roads for special signs calling attention to these services. Moreover, it is assumed that service signing will not be required in urban areas except for hospitals, Police assistance, | II-20 (c) Rev. 3 tourist information centers and camping.

It is quite likely, however, that general service signs will be desirable or necessary where such services are infrequent, and are to be found only on an intersecting highway or crossroad. Under such conditions, States that elect to provide service signing should establish a statewide policy or warrant for its use and criteria for the availability of services, based on national guidelines. Local jurisdictions for such signing should follow the State policy for the sake of uniformity.

General service signs, if used at intersections, shall carry legends for one or more of the following services: Food, Gas, Lodging, Camping, Phone, Hospital, Diesel, or Tourist Information, along with a directional | II-2 (c) Rev. 2 message. The service legends may be either symbols or word messages, but the intermixing of symbols and word messages on one sign shall not be permitted. Formats for displaying different combinations of these services are presented in section 2F-33.

The International Symbol for Access for the Handicapped Sign (D9-6) may be used beneath General Service signs where paved ramps and restroom facilities accessible to, and usable by, the physically handicapped are provided.

Where the distance to the next point at which services are available is 10 miles or more, a sign NEXT SERVICES (12) MILES may be used as a separate panel mounted under the General Service signs.

* Available from GPO, see page ii.

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D9-1
24″ x 24″

D9-2
24″ x 24″

D9-3
24″ x 24″

D9-3a
24″ x 24″

D9-6
24″ x 24″

D9-8
24″ x 24″

D9-7
24″ x 24″

D9-9
24″ x 24″

D9-10
24″ x 24″

D9-11
24″ x 24″

D9-12
24″ x 24″

D9-13
24″ x 24″

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D9-14
12″ x 24″

II-20 (c)
Rev. 3

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The Recreational Vehicle Sanitary Station sign (D9-12) may be used as needed to indicate the availability of facilities designed for the use of dumping wastes from recreational vehicle holding tanks.

In advance of roadside turnouts or rest areas, a Trash Receptacle Symbol sign (D9-4) may be placed provided it does not compete with other more important regulatory, warning, and directional signs.

A Channel 9 Monitored sign (D12-3) may be installed as needed. Only official government agencies or their designee may be shown as the monitoring agency on the sign. (see sec. 2F-37). II-12 (c) Rev. 2

All service signs, and supplemental panels, shall have reflectorized white letters, symbols and border on a reflectorized or opaque blue background and are to be erected at a suitable distance in advance of the turnoff point or intersecting highway.

The Emergency Medical Services (EMS) Symbol Sign (D9-13) may be used to identify medical service facilities that have been included in the EMS system under criteria established by the National Highway Traffic Safety Administration. The EMS Symbol sign shall not be used to identify services other than qualified hospitals, ambulance stations, and qualified free standing emergency medical treatment centers. In all cases when used, the EMS Symbol must be supplemented by a sign identifying the type of service provided. For instance, the EMS Symbol sign may be used above the HOSPITAL or H symbol sign or above a panel with either the legend AMBULANCE STATION or EMERGENCY MEDICAL CARE. The EMS Symbol may also be used to supplement telephone, CB monitoring, or POLICE signs. The legend EMERGENCY MEDICAL CARE shall not be used for services other than qualified free standing emergency medical treatment centers. II-46 (c) Rev. 3

Each State should develop guidelines for the implementation of the EMS symbol sign.

### 2D-47 Mileposts (D10-1 to 3)

To assist the driver in estimating his progress, to provide a means for identifying the location of emergency incidents, and to aid in highway maintenance and servicing, mileposts may be erected along any section of a numbered highway route. Zero distance should begin at the south and west state lines and at junctions where routes begin.

The distance numbering shall be continuous for each route within a State, except where overlaps occur. With overlapped routes, continuity shall be established for only one of the routes. On the route without milepost continuity, the first milepost beyond the overlap should indicate the total distance traveled on the route so that a motorist may have a means of correlating his travel distance between mileposts with that shown on his odometer.

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D10–1
10″ x 18″

D10–2
10″ x 27″

D10–3
10″ x 36″

Milepost signs shall be vertical panels with 6-inch white numerals, a border and the legend MILE in 4-inch letters on a green background and shall be reflectorized. Milepost signs may be placed up to 30 feet from the edge of pavement. Milepost signs located in line with delineator posts shall have the bottom of the sign at the same height as the delineator (see sec. 3D-5).

Small size 6 × 9 inch mileposts with 4-inch numerals, without the legend MILE, may be used on low volume, low speed, rural unnumbered roads in lieu of the D-10 series.

For divided highways, distance measurement shall be made on northbound and eastbound roadways. The mileposts for southbound and westbound roadways shall be set at locations directly opposite. When a milepost cannot be erected in its correct location, it may be moved in either direction as much as 50 feet. If it cannot be placed within 50 feet of its correct location, it should be omitted.

While mileposts serve as a guide for motorists, they also provide a means of identifying traffic accident locations and sections of highway for maintenance or other purposes. To further enhance the usefulness of this system, delineators may be spaced at 1/10 or 1/20 of a mile, and can be marked in fractions of a mile by stencil on the back of the delineator or post or by a small plate on the delineator post. This plate shall not be considered as a milepost, therefore will not be green and white in color. The numeral shall be small and preferably on the back side of the post or delineator.

### 2D-48 Traffic Signal Speed Sign (I1-1)

The Traffic Signal Speed sign, reading SIGNALS SET FOR (25) M.P.H., may be used to indicate a section of highway on which the traffic control signals are coordinated into a pretimed progressive system and

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I1–1
12" x 18"

timed for a specified speed at all hours during which they are operated on a stop-and-go basis. Where used, the sign should be mounted on, or as near as possible to, each signal face where the timed speed changes, and at intervals of several blocks throughout any section where the timed speed remains constant.

This sign shall be a minimum of 12 × 18 inches with the longer dimension vertical. It shall always have a white reflectorized message and border on a green reflectorized background.

### 2D-49 General Information Signs (I Series)

Of interest to the traveler, though not directly necessary for guidance, are numerous kinds of information that may properly be conveyed by information signs. They include such items as State lines, city limits, and other political boundaries, time zones, stream names, elevations, landmarks and similar items of geographical interest. Such signs should not be installed within a series of guide signs or at other equally critical locations, unless there are specific reasons for orienting the highways user or identifying control points for activities that are clearly in the public interest. On all such signs the design should be simple and dignified, devoid of any advertising and in general conformance with other guide signing.

An informational symbol sign (I-5, 6 or 7) may be used to identify a route leading to a commercial airport, bus terminal, or railroad station, and to provide additional guidance to the facility. The symbol sign may be supplemented by an educational plaque where necessary; also, the name of the facility may be used if needed to distinguish between two similar facilities.

Political jurisdiction logos may be placed on political boundary General Information signs; however, the predominant characteristics of the sign

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I-2
Variable Size

I-3
Variable Size

I-4
24" x 24"

I-5
24"×24"

I-6
24"×24"

I-7
24"×24"

will be a white legend on a green rectangular shaped background. The logo may have different colors and shapes but should be simple and dignified, devoid of any advertising.

All General Information signs shall conform to the general standards for guide signs, and shall be reflectorized where required to provide nighttime visibility.

These signs shall be erected in accordance with the general specifications (secs. 2A-23, 24).

### 2D-50 Signing of Named Highways

Federal and State legislative bodies will from time to time adopt an act or resolution memorializing a highway, bridge or other component of highway. Such memorial names shall not appear on or along a highway, bridge or other component, but memorial plaques to recognize such a destination may be erected in rest areas, scenic overlooks or other appropriate points inconspicuously located relative to vehicle operators' viewing.

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Guide signs may contain names if the purpose is to enhance driver communication and guidance; however, they are to be considered as supplemental information to route numbers. Highway names are not to replace official numeral designations. Memorial names shall not appear independently on supplemental signs nor on any other information sign either on or along the highway or its intersecting routes.

The use of route markers will be restricted to markers officially used for guidance of traffic in accordance with the Manual and the "Purpose and Policy" statement of American Association of State Highway and Transportation Officials which applies to Interstate and U.S. numbered routes.

The signing for unnumbered routes having major importance to proper guidance of traffic is permissible if carried out in accordance with the aforementioned policies. For unnumbered highways, a name to enhance route guidance may be used where the name is applied consistently throughout its length. Not more than one name should be used to identify any highway whether numbered or unnumbered.

### 2D-51 Trail Markers

Trail Markers are informational plaques or shields designed to provide the traveling public with route guidance in following a trail of particular cultural, historical, or educational significance. These markers satisfy an information need on the part of certain travelers but primary guidance should be in the form of printed literature and strip maps rather than highway signing.

Except on the Interstate System, trail markers signs may be erected when they have been approved by and are under the control of the State highway organization. Control of such markers by a county or city highway department is also satisfactory. The installation must be consistent with highway safety practices and with practices governing signs of this general nature.

### 2D-52 Crossover Signs (D13-1, D13-2)

The CROSSOVER sign may be erected on divided highways to mark median openings not otherwise marked by Warning or Guide signs. It shall not be used to mark median openings that are restricted to the use of official or authorized vehicles. The sign shall be a horizontal rectangle of appropriate size to carry the word CROSSOVER and a horizontal directional arrow. If used, it should be erected immediately beyond the median opening either on the right side of the roadway or in the median. II-7 (c) Rev. 3

The Advance Crossover sign may be erected in advance of the CROSSOVER sign to provide advance information of the crossover. The sign shall be a horizontal rectangle of appropriate size to carry the word

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CROSSOVER and a distance. The distance shown should be either 1, ½, or ¼ mile, unless unusual conditions require some other distance. If used, the sign should be erected on the right side of the roadway at approximately the distance shown.

CROSSOVER signs shall have a white reflectorized legend and border on a green background.

II-7 (c)
Rev. 3

D13-1
72″×36

D13-2
72″×36″

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2. A second line may be used on the sign, and when used, should be reserved for communities of general interest which are on or immediately adjacent to the route or major traffic generators that the route was specifically located to serve. The choice of names for the second line, when it is used, can be varied on successive distance signs to give motorists maximum information concerning communities served by the expressway.

3. The third, or bottom line, shall contain the name and distance to a control city (if any) which has national significance for travelers using the expressway route.

Under normal conditions, distances to the same destinations should not be shown more frequently than at five-mile intervals. The distances displayed on these signs should be the actual distance to the destination points and not to the exit from the expressway.

E7

*Figure 2-17. Post interchange distance sign.*

**2E-34 Interchange Sequence Series Signs (fig. 2-18)**

Where interchanges are so closely spaced, particularly through large urban areas, that major guide signs cannot be adequately spaced, interchange sequence series signs identifying the next two or three interchanges may be used. Interchange sequence series signs are generally supplemental to advance guide signs. However, where there is less than 800 feet between interchanges, such signs should be used in lieu of the advance guide signs for the affected interchanges. Interchange sequence series signs shall not be substituted for exit direction signs.

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When such signs are used, it is preferable to use them over the entire length of a route in an urban area. They should not be used on a single interchange basis. Signing of this type is illustrated in figures 2–18 and 2–41, (page 2F–32) and is compatible with the sign spreading concept.

These signs display the next two or three interchanges by name or route number with distances to the nearest ¼ mile. Interchange numbers may be shown to the left of the interchange name or route number. When used, the first sign in the series shall be located in advance of the first advance guide sign for the first interchange. Thereafter, the signs should be placed approximately midway between interchanges. The signs shall be mounted at overhead height preferably in the median.

*Figure 2–18. E8–1*

Where appropriate, interchange names or route numbers shown on such signs may be followed by the legend LEFT or LEFT EXIT in black letters on a yellow rectangular background where the exit direction is to the left. Separate panels may be attached to the sign panels for this purpose.

II-38 (c)
P- 3

**2E–35 Community Interchanges Identification Sign (E8–2, fig. 2–19)**

For suburban or rural communities served by two or three interchanges, community interchange identification signs are useful. In these cases the name of the community followed by the word "Exits" should be shown on the top line; the destination, state (road) name or route number, and the corresponding distances to the nearest ¼ mile should be shown below.

*Figure 2–19. E8–2*

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The sign should be located in advance of the first advance guide sign for the first interchange within the community. If interchanges are not conveniently identifiable or if there are more than three interchanges as to be identified, the Next (X) Exits Area sign (E9) may be used.

### 2E-36 Next (X) Exits Area Sign (fig. 2-20)

Expressways may pass through " historical" or "recreational" regions, or urban areas served by a succession of several interchanges. Such regions or areas may be indicated by a special sign located in advance of the advance guide sign or signs for the first interchange. The sign legend should identify the region or area followed by the words NEXT (X) EXITS.

E9

*Figure 2-20. Next (x) exits area sign.*

### 2E-37 Signing for General Motorist Services (fig. 2-21)

On rural sections of expressways where general motorist services are infrequent, service signing may be needed. In such cases, the provisions of section 2D-46 will apply, except that signs should be suitably enlarged. Letter and numeral sizes are shown in table II-1 (page 2E-4). Approved symbols may be used as an alternate to word messages whenever motorist service signs are used but intermixing of symbols and word legends shall not be permitted.

The interchange exit number may be displayed atop the main panel (see fig. 2-43, page 2F-35). The action message line may then show the distance to the exit.

Special signs or other displays may be erected in safety rest areas, scenic overlooks, roadside turnouts and similar areas, for providing motorists

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*Figure 2-21. Signing for General Motorist Services.*

with specific services information. National criteria for such postings are given in the Code of Federal Regulations, 23 CFR 655C.*

### 2E-38 Rest and Scenic Areas

Signing for safety rest areas and for scenic areas should conform to the provisions previously set forth in sections 2D-42 and 2D-43. However, the signs should be suitably enlarged for expressway application. To provide the motorist with information on the location of succeeding rest areas a sign with the word message NEXT REST AREA XX MILES may be installed independently or as a supplemental panel mounted below one of the advance rest area guide signs. The sign or panel shall have reflectorized white letters and border on a blue background. Letter and numeral sizes are shown in Table II-1 (page 2E-4).

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### 2E-39 Recreational and Cultural Interest Area Signs

Recreational and cultural interest area signs of the type described previously in section 2D-44 may have application on expressway facilities. Where such signs are used, the provisions of the section should be followed with suitable enlargement of the signs for expressway conditions.

### 2E-40 Milepost Markers

Milepost markers will be required on expressway facilities which are located on a route where there is milepost continuity. In such cases, the provisions of section 2F-39 will apply.

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* National Standards for Signs Giving Specific Information in the Interest of the Traveling Public, FHPM 6-8-3-8.

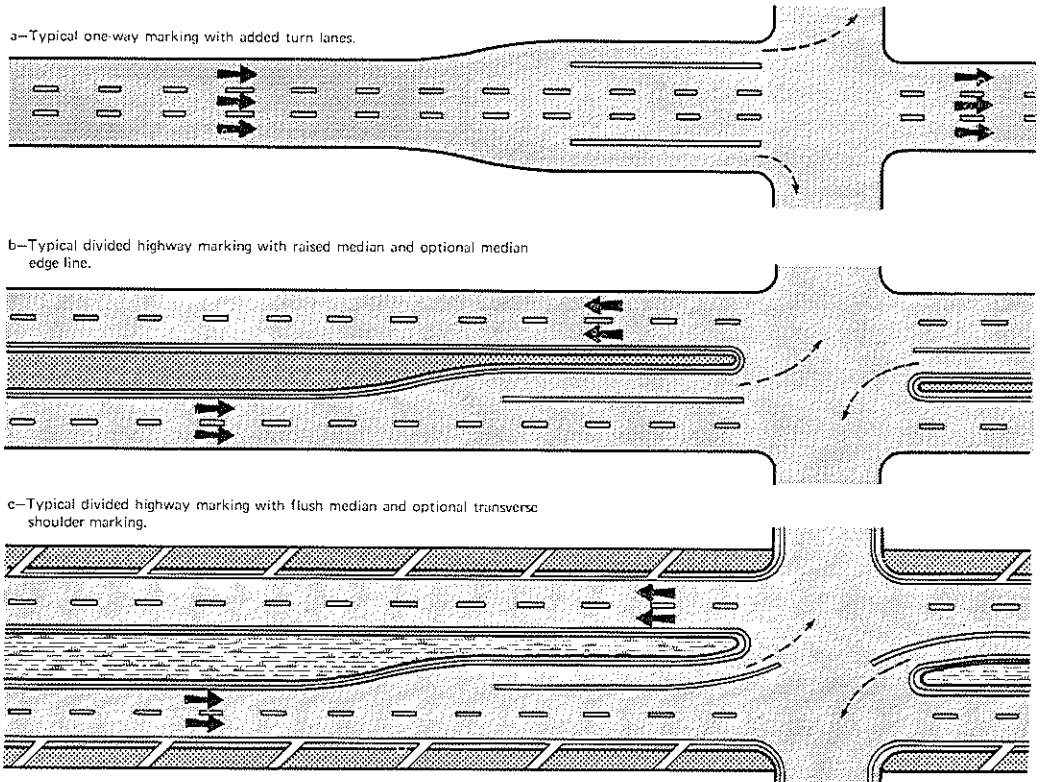
a—Typical one-way marking with added turn lanes.
b—Typical divided highway marking with raised median and optional median edge line.
c—Typical divided highway marking with flush median and optional transverse shoulder marking.

***Figure 3-6. Typical one-way and divided highway marking applications.***



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In addition to the pavement markings here prescribed, no-passing zone signs (secs. 2B-21, 2B-22 and 2C-38) may be used to emphasize the existence and extent of a no-passing zone.

Where the distance between successive no-passing zones is less than 400 feet, the appropriate no-passing marking (one direction or two direction) should connect the zones.

The no-passing marking is also used on two-way roadways at pavement width transitions (sec. 3B-8) and on approaches to obstructions which must be passed on the right (sec. 3B-13). It may also be used on approaches to railroad grade crossings and other locations where passing should be prohibited.

### 3B-5 Warrants for No-Passing Zones at Curves

A no-passing zone at a horizontal or vertical curve is warranted where the sight distance, as defined below, is less than the minimum necessary for safe passing at the prevailing speed of traffic. Passing sight distance on a vertical curve is the distance at which an object 3.50 feet above the pavement surface can just be seen from a point 3.50 feet above the pavement (fig. 3-8a). Similarly, passing sight distance on a horizontal curve is the distance measured along the center line (or right hand lane line of a three-lane highway) between two points 3.50 feet above the pavement on a line tangent to the embankment or other obstruction that cuts off the view on the inside of the curve (fig. 3-8b). Where center lines are installed and a curve warrants a no-passing zone, it should be so marked where the sight distance is equal to or less than that listed below for the prevailing off-peak 85 percentile speed:

III-4 (c) Rev. 3

| 85 Percentile Speed (MPH) | Minimum Passing Sight Distance (Feet) |
|---|---|
| 30 | 500 |
| 40 | 600 |
| 50 | 800 |
| 60 | 1000 |
| 70 | 1200 |

The beginning of a no-passing zone (point "a," fig. 3-8) is that point at which the sight distance first becomes less than that specified in the above table. The end of the zone (point "b") is that point at which the sight distance again becomes greater than the minimum specified.

### 3B-6 Pavement Edge Lines

Pavement edge line markings provide an edge of pavement guide for drivers. They have a unique value as a visual reference for the guidance of drivers during adverse weather and visibility conditions. They also may be used where edge delineation is desirable to reduce driving on paved

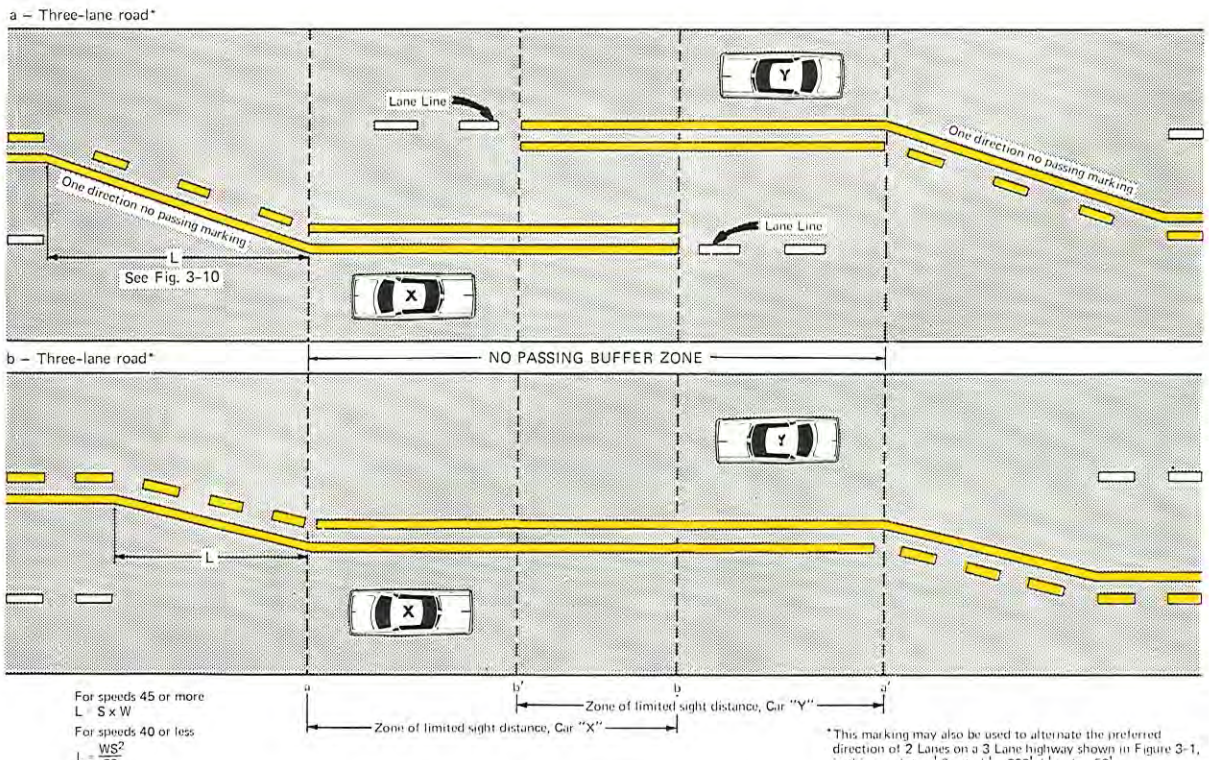
a – Three-lane road*
Lane Line
One direction no passing marking
L
See Fig. 3-10
Y
X
Lane Line
One direction no passing marking
b – Three-lane road*
NO PASSING BUFFER ZONE
L
Y
X
For speeds 45 or more
L = S x W
For speeds 40 or less
L = WS²/60
a
b'
b
a'
Zone of limited sight distance, Car "Y"
Zone of limited sight distance, Car "X"
*This marking may also be used to alternate the preferred direction of 2 Lanes on a 3 Lane highway shown in Figure 3-1, in this case b to a' & a to b' 300', b' to b = 50'.

***Figure 3-7. Standard 3-lane, two-way pavement marking for alternating preferred direction of two lanes.***



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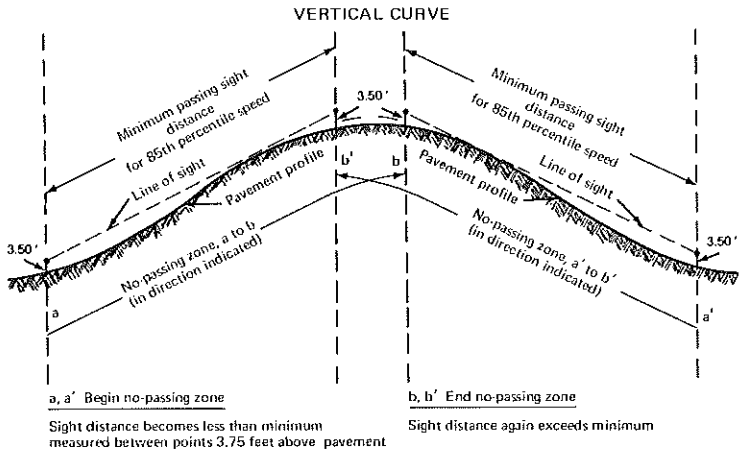
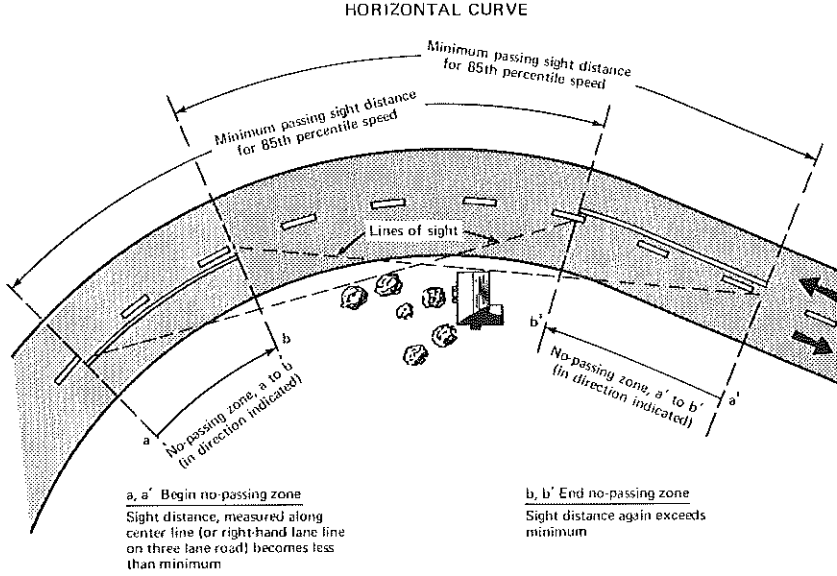

VERTICAL CURVE
Minimum passing sight distance for 85th percentile speed
Line of sight
Pavement profile
3.50'
b'
b
No-passing zone, a to b (in direction indicated)
a
Minimum passing sight distance for 85th percentile speed
Line of sight
Pavement profile
No-passing zone, a' to b' (in direction indicated)
a'
a, a' Begin no-passing zone
Sight distance becomes less than minimum measured between points 3.75 feet above pavement
b, b' End no-passing zone
Sight distance again exceeds minimum

Note: No-passing zones in opposite directions may or may not overlap, depending on alignment.


HORIZONTAL CURVE
Minimum passing sight distance for 85th percentile speed
Minimum passing sight distance for 85th percentile speed
Lines of sight
b
a
No-passing zone, a to b (in direction indicated)
b'
No-passing zone, a' to b' (in direction indicated)
a'
a, a' Begin no-passing zone
Sight distance, measured along center line (or right-hand lane line on three lane road) becomes less than minimum
b, b' End no-passing zone
Sight distance again exceeds minimum

Note: No-passing zones in opposite directions may or may not overlap, depending on alignment.

III-4 (c)
Rev. 3

***Figure 3-8. Method of locating and determining the limits of no-passing zones at vertical and horizontal curves.***

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shoulders or refuge areas of lesser structural strength than adjacent pavement. Edge lines shall not be continued through intersections and should not be broken for driveways.

Edge lines shall be provided on all Interstate highways, on rural multilane divided highways, and may be used on other classes of roads. The lines shall be white except that on the left edge of each roadway of divided streets and highways, and one-way roadways in the direction of travel, they shall be yellow. III-6 (c) Rev. 1

### 3B-7 Pavement Marking Extensions Through Intersections or Interchanges

Where road design or reduced visibility conditions make it desirable to provide control or to guide vehicles through an interchange or intersection, (such as at offset, skewed, complex multi-legged intersections or where multiple turn lanes are used) a dotted line may be used to extend markings as necessary through the interchange or intersection area (figs. 3-9a, 3-11). Where a greater degree of restriction is required, solid lane lines or channelizing lines may be continued through intersections. A frequent use for the channelizing line is to separate turning movements (figs. 3-9b, 3-9c).

### 3B-8 Lane Reduction Transitions

Where pavement markings are used, lane reduction markings shall be used to guide traffic at points where the pavement width changes to a lesser number of through lanes. No-passing markings shall be used to prohibit passing in the direction of the convergence, throughout the transition area. The length of transition (taper length) for a lane reduction should be computed by the formula $L = WS$ for freeways, expressways, and all other roadways having a posted speed of 45 m.p.h. or greater. Formula $L = WS^2/60$ should be used to compute taper length on urban, residential, and other streets where the posted speeds are 40 m.p.h. or less. Under both formulas, L equals the taper length in feet, W the offset distance in feet, and S the off-peak 85 percentile speed in miles per hour. On new construction, where no 85 percentile speed is established, the design speed may be used.

A number of situations are possible, as illustrated in figure 3-10, depending on which lanes must be offset or terminated and the amount of offset. One or more lane lines must be connected in such a way as to merge traffic into the reduced number of lanes.

Lane lines should be discontinued one-quarter of the distance between the Pavement Width Transition sign (sec. 2C-19) and the point of convergence. Edge lines should be installed from the location of the warning sign, past the beginning of the narrower roadway (fig. 3-10).

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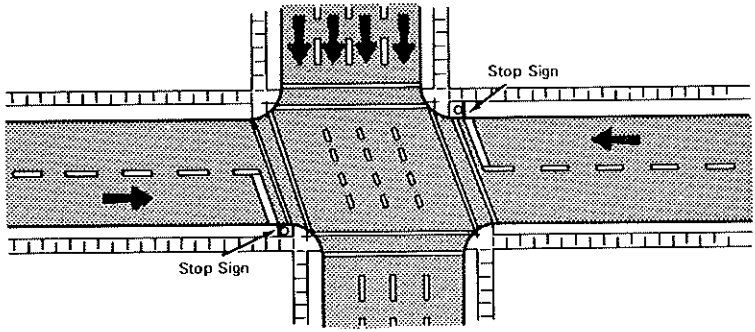
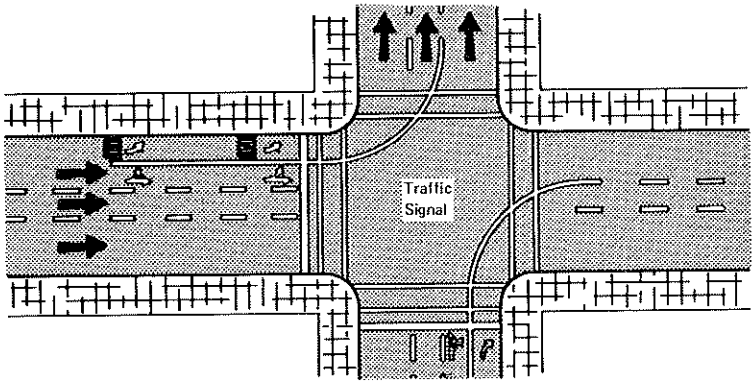
a—Typical pavement marking with offset lane lines continued through the intersection and optional crosswalk lines and stop limit lines.




b—Typical pavement marking with optional double turn lane lines, pavement messages, crosswalk lines, and stop limit lines.




c—Typical pavement marking with optional turn lane lines, crosswalk lines, and stop limit lines.

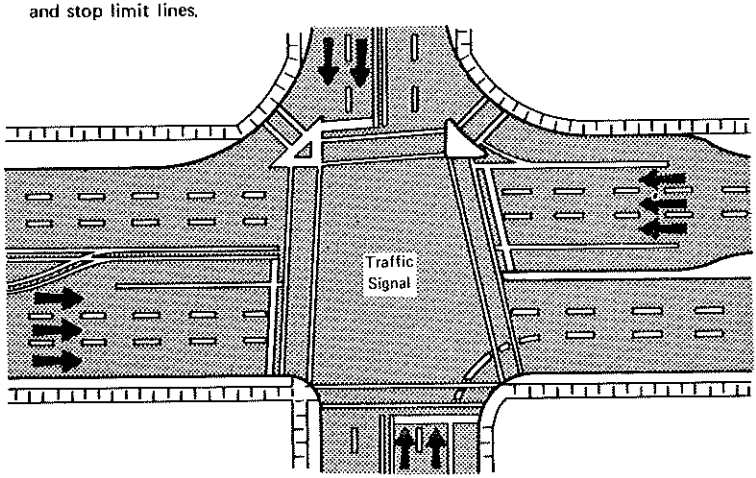



***Figure 3-9. Typical pavement marking applications.***

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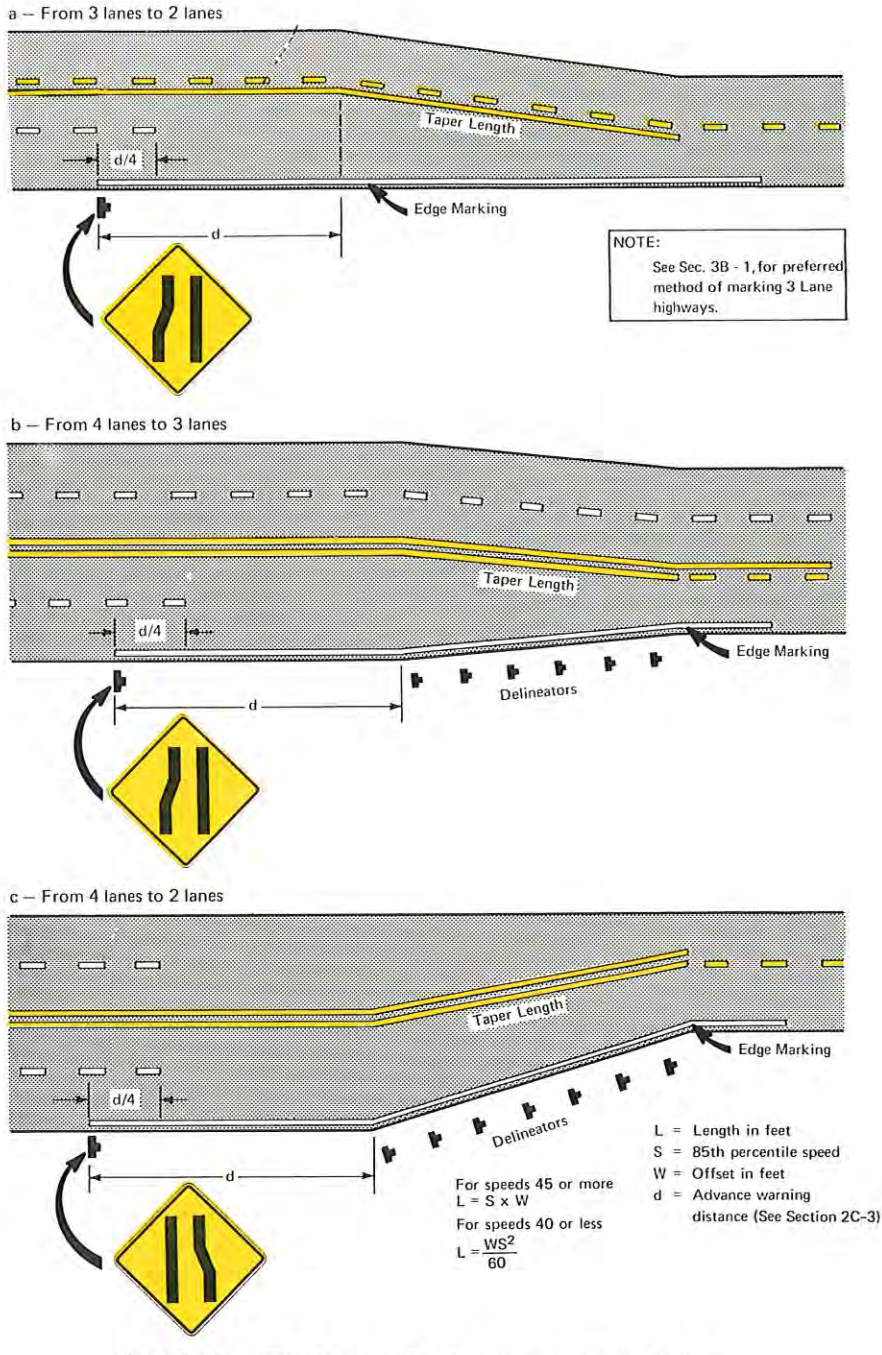


***Figure 3-10. Typical lane reduction transition markings and signs.***

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Pavement markings at pavement-width transitions supplement the standard signs.

### 3B-9 Channelizing Line

The channelizing line shall be a wide or double solid white line.

The channelizing line may be used to form traffic islands where travel in the same direction is permitted on both sides. Other markings in the island area such as crosshatching shall be white.

Typical examples of channelizing line applications are shown in figures 3-9, 3-11, 3-12 and 3-13.

### 3B-10 Median Islands Formed by Pavement Markings

Two double solid yellow lines shall be used to form continuous median islands where these islands separate travel in opposite directions. Other markings in the median island area such as crosshatching shall be yellow (sec. 3A-8).

### 3B-11 Marking of Interchange Ramps

Channelizing lines at exit ramps provide a neutral area which reduces the probability of collision with the curb nose and also directs exiting traffic at the proper angle for smooth divergence into the ramp (fig. 3-11). The channelizing line promotes safe and efficient merging with the through traffic at entrance ramps (fig. 3-12).

For exit ramps, channelizing lines shall be placed along both sides of the neutral area between the main roadway and the exit ramp lane. With a parallel deceleration lane, a lane line shall be extended from the beginning of the channelizing line upstream for a distance of approximately one-half the length of the full width deceleration lane. White transverse markings may be placed in the neutral area for special emphasis. III-18 (c) Rev. 2

For entrance ramps, a channelizing line should be placed along the side of the neutral area adjacent to the ramp lane. With a parallel acceleration lane, a lane line should be extended from the end of the channelizing line for a distance approximately one-half the length of the full width acceleration lane. With a tapered acceleration lane, a lane line may be placed to extend the channelizing line, but not beyond a point where the tapered lane meets the near side of the through traffic lane. Pavement marking arrow usage for Wrong-Way traffic is included in Section 2E-41. III-16 (c) Rev. 2

In advance of lane drops at off ramps a special marking pattern may be used to distinguish the lane drop situation from a normal exiting ramp or an auxiliary lane. A typical special marking for lane drops consists of 8-inch wide by 3-foot long white stripes separated by 12-foot gaps. If used, this special marking should begin ½ mile in advance of the theoretical gore point. Where last minute lane changes may cause conflicts, an 8-inch wide solid white channelizing line may extend approximately 300 feet upstream from the theoretical gore point. III-10 (c) Rev. 3

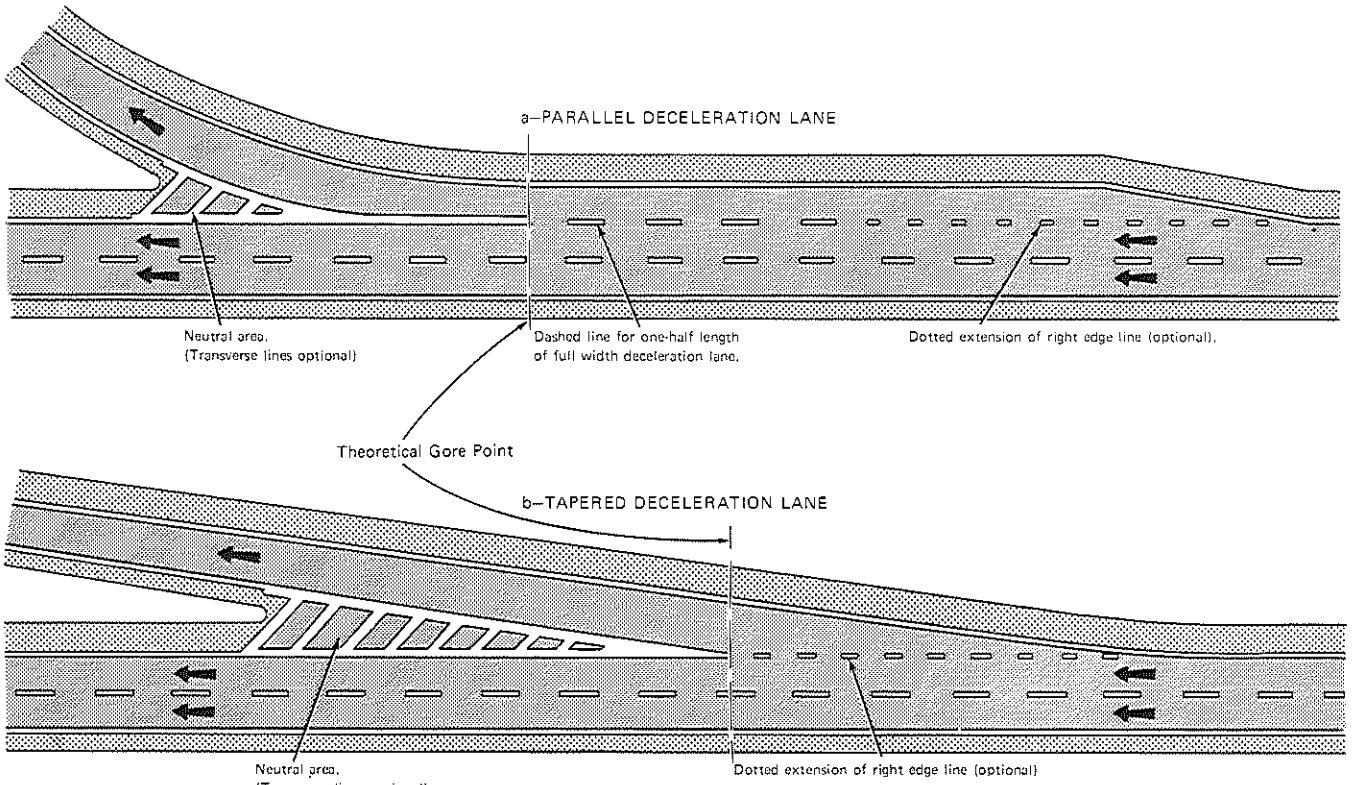


***Figure 3-11. Typical exit ramp markings.***



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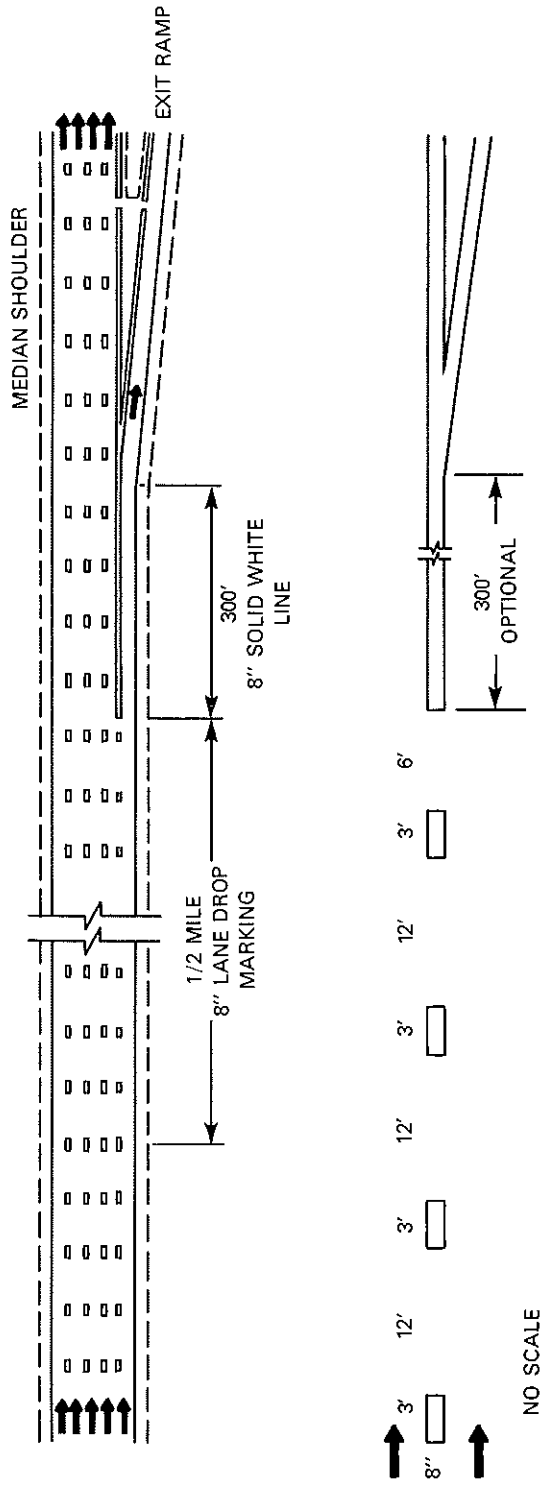


*Figure 3-11a. Lane drop markings at exit ramps*

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a–PARALLEL ACCELERATION LANE
Dashed line for one-half length of full width acceleration lane.
b–TAPERED ACCELERATION LANE
Edge of through lane
Lane width

*Figure 3-12. Typical entrance ramp markings.*

Scan by Kittelson LLC

### 3B-12 Combination Lane and Center Line Markings for Unique Applications

It is sometimes necessary to use markings in certain combinations not previously described for special applications intended to improve traffic operations.

For reversible lane markings, each edge of the lane shall be marked by the use of a double, normal, broken yellow line with the gaps and segments adjacent to one another. Signs and/or signals shall be used to supplement the pavement markings (fig. 3-1, page 3B-3).

A two-way left turn lane is a lane reserved in the center of a highway for exclusive use of left turn vehicles and shall not be used for passing and overtaking or travel by a driver except to make a left turn. The lane may be used by drivers making the left turn in either direction. A two-way left turn lane shall be marked by a single direction, no-passing marking on each edge of the lane. This is generally used on a five lane highway where there are two lanes of through traffic in each direction. Signs shall be used with the pavement markings (sec. 2B-19). Symbol markings as shown in figure 3-5a may be used in addition to the required signs.

### 3B-13 Approach to an Obstruction

Pavement markings shall be used to guide traffic on the approach to fixed obstructions within a paved roadway. An obstruction may be so located that all traffic must keep to the right of it, or it may be between two lanes of traffic moving in the same direction. The markings in either case must be designed to guide traffic away from the obstruction. The use of channelizing lines or no-passing markings are generally effective. Obstruction approach markings for bridge supports, refuge islands, median islands, and channelization islands shall consist of a diagonal line, or lines, extending from the center line or the lane line to a point 1 or 2 feet to the right side, or to both sides, of the approach end of the obstruction (fig. 3-13).

The length of the diagonal markings (taper length) should be computed by the formula $L = WS$ for freeways, expressways and all other roadways having a posted speed of 45 m.p.h. or greater. The formula $L = WS^2/60$ should be used to compute taper length on urban, residential, and other streets where the posted speeds are 40 m.p.h. or less. Under both formulas, L equals the taper length in feet, W the width of the offset in feet, and S the off-peak 85 percentile speed in miles per hour. The minimum taper length shall be 100 feet in urban areas and 200 feet in rural areas.

If traffic is required to pass only to the right of the obstruction, the marking shall consist of a no-passing marking at least twice the length of the diagonal portion determined by the applicable taper formula (above). Yellow markings may be placed in the triangular area so formed.

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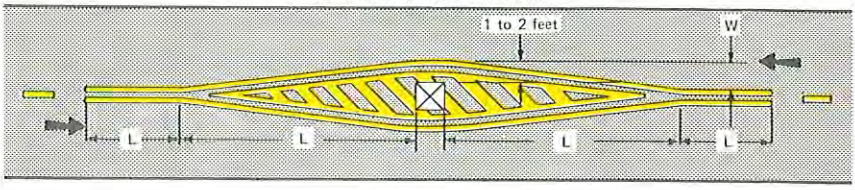
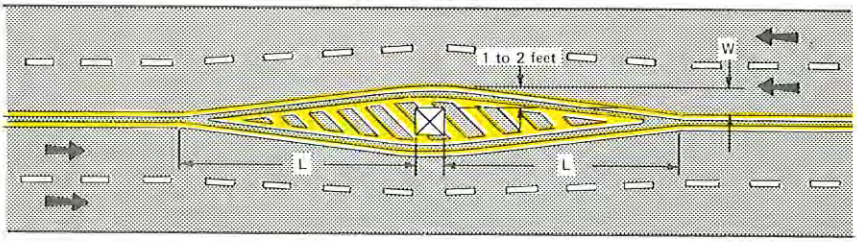
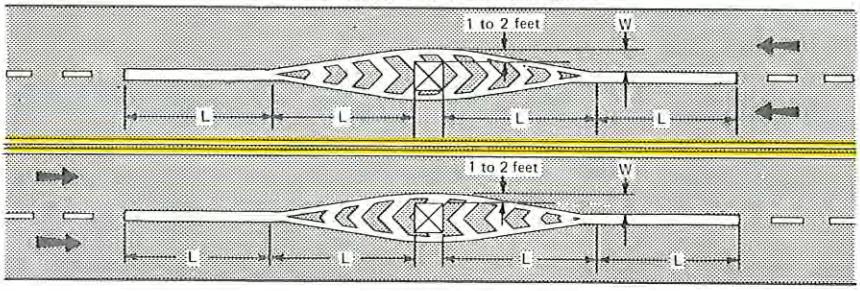
a – Center of two-lane road.




b – Center of four-lane road.




c – Traffic passing both sides of obstruction




For speeds 45 or more $L = S \times W$ For speeds 40 or less $L = \frac{WS^2}{60}$

S = 85th percentile speed in miles per hour
W = Offset distance in feet

Minimum length of: L = 100 feet in urban areas
L = 200 feet in rural areas

Length "L" should be extended as required by sight distance conditions.

***Figure 3-13. Typical approach markings for obstructions in the roadway.***

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If traffic may pass either to right or left of the obstruction, the markings shall consist of two channelizing lines diverging from the lane line, one to either side of the obstruction for a length determined by the applicable taper formula. In advance of the point of divergence, a wide solid white line or double white line shall be extended in place of the broken lane line for a distance equal to the length of the diverging lines. Additional white markings may be placed in the triangular area between the channelizing lines.

### 3B-14 Stop Lines

Stop lines are solid white lines, normally 12 to 24 inches wide, extending across all approach lanes.

Stop lines should be used in both rural and urban areas where it is important to indicate the point, behind which vehicles are required to stop, in compliance with a STOP sign, traffic signal, officers' direction, or other legal requirement.

Stop lines, where used, should ordinarily be placed 4 feet in advance of and parallel to the nearest crosswalk line. In the absence of a marked crosswalk, the Stop line should be placed at the desired stopping point, in no case more than 30 feet or less than 4 feet from the nearest edge of the intersecting roadway.

If a stop line is used in conjunction with a STOP sign, it should ordinarily be placed in line with the STOP sign. However, if the sign cannot be located exactly where vehicles are expected to stop, the Stop line should be placed at the stopping point.

### 3B-15 Crosswalks and Crosswalk Lines

Crosswalk markings at signalized intersections and across intersectional approaches on which traffic stops, serve primarily to guide pedestrians in the proper paths. Crosswalk markings across roadways on which traffic is not controlled by traffic signals or STOP signs, must also serve to warn the motorist of a pedestrian crossing point. At non-intersectional locations, these markings legally establish the crosswalk.

Crosswalk lines shall be solid white lines, marking both edges of the crosswalk. They shall be not less than 6 inches in width and should not be spaced less than 6 feet apart. Under special circumstances where a stop line is not provided or where vehicular speeds exceed 35 MPH or where crosswalks are unexpected, it may be desirable to increase the width of the crosswalk line up to 24″ in width. Crosswalk lines on both sides of the crosswalk should extend across the full width of pavement to discourage diagonal walking between crosswalks (fig. 3-14a).

Crosswalks should be marked at all intersections where there is substantial conflict between vehicle and pedestrian movements. Marked crosswalks should also be provided at other appropriate points of

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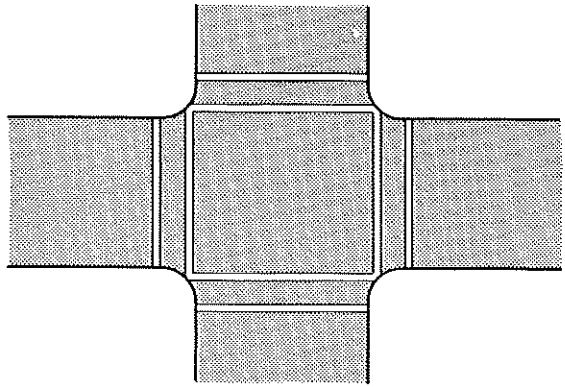
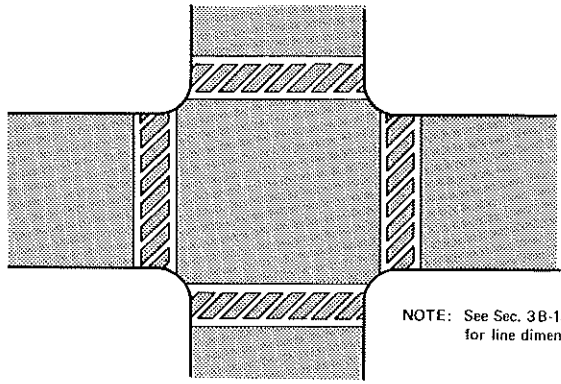
a -- Standard crosswalk marking.



b -- Crosswalk marking with diagonal lines for added visibility.




c -- Crosswalk marking with longitudinal lines for added visibility.

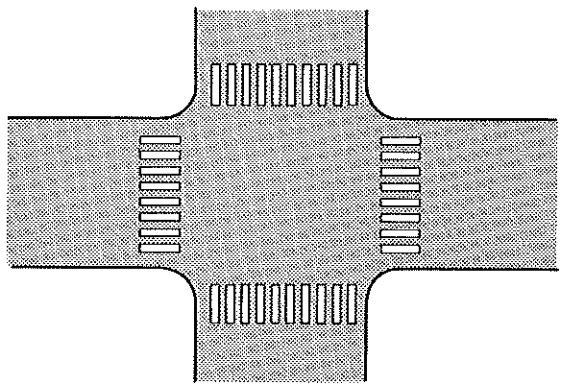


***Figure 3-14. Typical crosswalk markings.***

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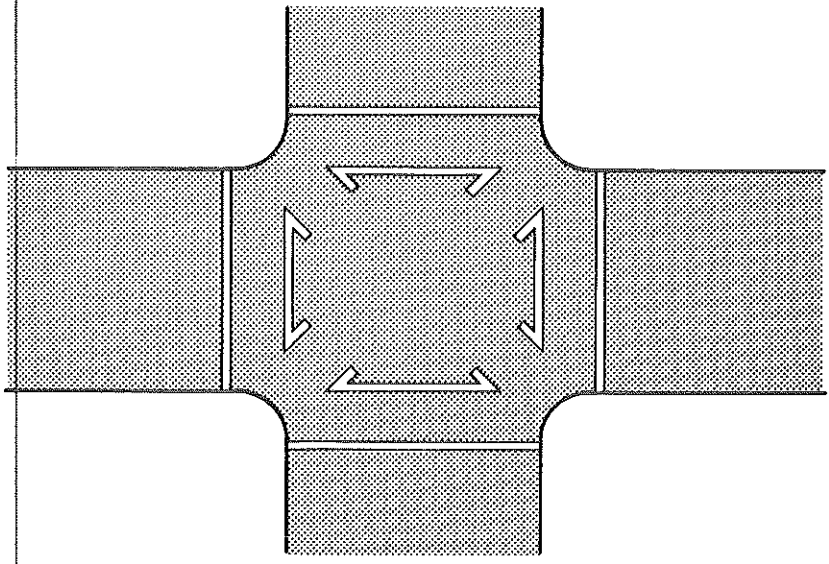
a — Crosswalk marking that outlines pedestrian travel paths.



b — Crosswalk marking that outlines the edge of pedestrian travel area.

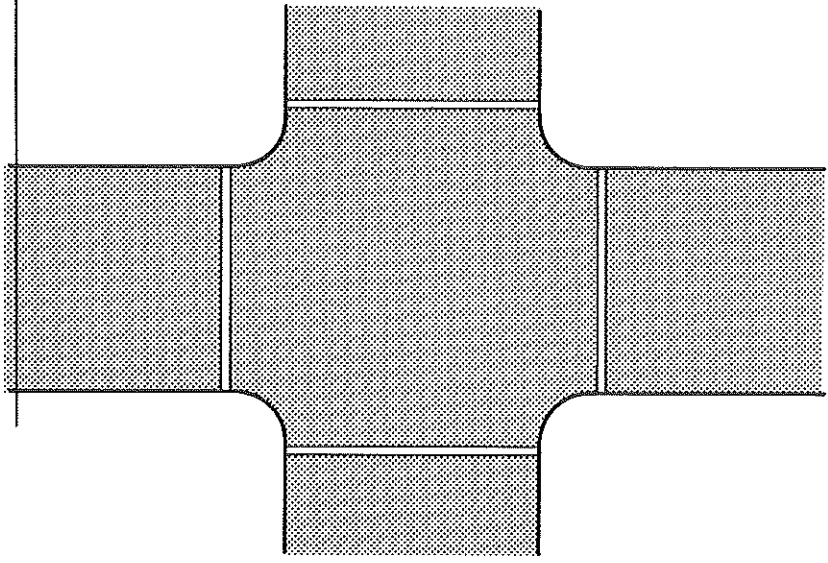


*Figure 3-15. Typical crosswalk marking for exclusive pedestrian phase.*

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pedestrian concentration, such as at loading islands, midblock pedestrian crossing, or where pedestrians could not otherwise recognize the proper place to cross.

Crosswalk markings should not be used indiscriminately. An engineering study should be required before they are installed at locations away from traffic signals or STOP signs.

Since non-intersectional pedestrian crossings are generally unexpected by the motorist, warning signs (sec. 2C–31) should be installed and adequate visibility provided by parking prohibitions.

For added visibility, the area of the crosswalk may be marked with white diagonal lines at a 45° angle or with white longitudinal lines at a 90° angle to the line of the crosswalk (figs. 3–14b, 14c). These lines should be approximately 12″ to 24″ wide and spaced 12″ to 24″ apart. When diagonal or longitudinal lines are used to mark a crosswalk, the transverse crosswalk lines may be omitted. This type of marking is intended for use at locations where substantial numbers of pedestrians cross without any other traffic control device, at locations where physical conditions are such that added visibility of the crosswalk is desired or at places where a pedestrian crosswalk might not be expected. Care should be taken to insure that crosswalks with diagonal or longitudinal lines used at some locations do not weaken or detract from other crosswalks (where special emphasis markings are not used) (fig. 3–14a). When an exclusive pedestrian phase signal, which permits diagonal crossing, is installed at an intersection, a unique marking may be used for the crosswalk (fig. 3–15).

### 3B–16 Parking Space Markings

Parking space markings shall be white.

The marking of parking space limits on urban streets encourages more orderly and efficient use of parking spaces where parking turnover is substantial and tends to prevent encroachment on fire hydrant zones, bus stops, loading zones, approaches to corners, clearance spaces for islands and other zones where parking is prohibited. Typical parking space markings are shown in figure 3–16.

### 3B–17 Pavement Word and Symbol Markings

Word and symbol markings on the pavement may be used for the purpose of guiding, warning, or regulating traffic. They should be limited to not more than a total of three lines of information. They shall be white in color.

Symbol arrows may be used to convey either guidance or mandatory messages; however, where a movement that would otherwise be legal is to be prohibited, the arrow marking must be accompanied by standard signs and the word marking "ONLY." Signs or markings should be repeated in advance of mandatory turn lanes when necessary to prevent entrapment

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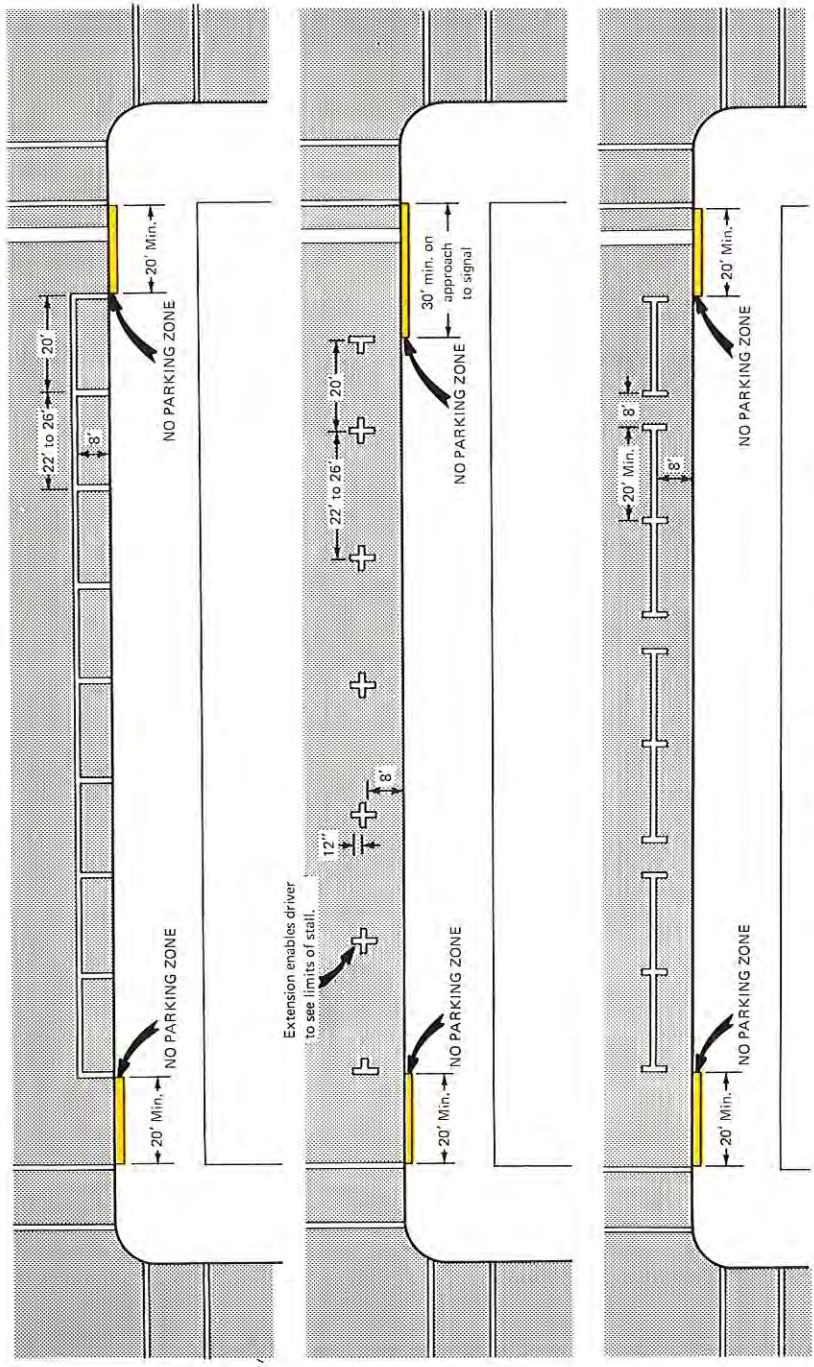


*Figure 3-16. Typical parking-space limit markings.*

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and to help motorists select the appropriate lane before reaching the end of the line of waiting vehicles.

All letters, numerals and symbols should be in conformance with the Standard Alphabets for Highway Signs and Pavement Markings.* Large letters and numerals should be used, 8 feet or more in height; and, if the message consists of more than one word, it should read "up," i.e., the first word should be nearest to the driver. Symbol messages are generally preferable to word messages.

Where speeds are low, somewhat smaller characters may be used. The space between lines should be at least four times the height of the characters for low speed roads but not more than ten times the height of the characters, under any conditions. Examples are shown in figures 3-17 and 3-18.

Word and symbol markings considered appropriate for use when warranted include the following:

1. Regulatory:
   "STOP"
   "RIGHT (LEFT) TURN ONLY"
   "25 MPH"
   "SYMBOL ARROWS" (Note: Symbol arrows shall be supplemented by word "ONLY," if mandatory.)
2. Warning:
   "STOP AHEAD"
   "SIGNAL AHEAD"
   "SCHOOL"
   "SCHOOL X-ING"
   "PED X-ING"
   "R X R" (Railroad Crossing)
   (secs. 8B-2, 8B-3)
3. Guide:
   "US 40"
   "ROUTE 40"
   "STATE 135" (Other words or symbols may be necessary under certain conditions.)

Since an uncontrolled use of pavement markings can result in driver confusion the number of different word and symbol markings should be minimized.

The word "STOP" shall not be used on the pavement unless accompanied by a stop line (sec. 3B-14) and STOP sign (sec. 2B-4).

The word STOP shall not be placed on the pavement in advance of a stop line, unless every vehicle is required to stop at all times.

Pavement messages should generally be no more than one lane in width except the "SCHOOL" messages (sec. 7C-6).

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* Available from the Federal Highway Administration (HTO-20), Washington, D.C. 20590.

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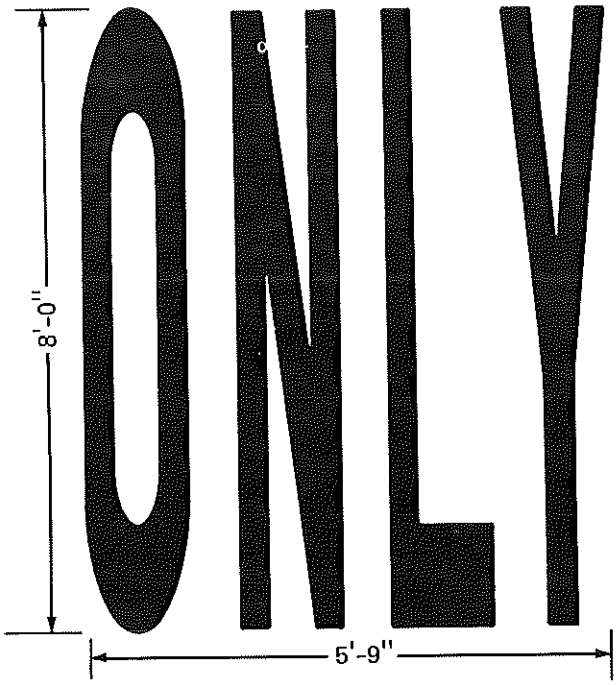


*Figure 3-17. Elongated letters for pavement marking.*

Figure 3-19 shows the use of word and symbol markings on the pavement.

### 3B-18 Curb Markings for Parking Restrictions

Since curb markings of yellow and white are used for delineation and visibility, it is usually advisable to establish parking regulations through the installation of standard signs (secs. 2B-31 to 33). However, when local authorities prescribe special colors for curb markings as supplemental to standard signs, they may be used.

When signs are not used, intended meaning should be stenciled on the curb.

Signs shall always be used with curb markings in those areas where curb markings are frequently obliterated by accumulations of snow and ice.

### 3B-19 Preferential Lane Markings

When a lane is assigned full or part time to a particular class or classes of vehicles, the preferential lane markings shall be used.

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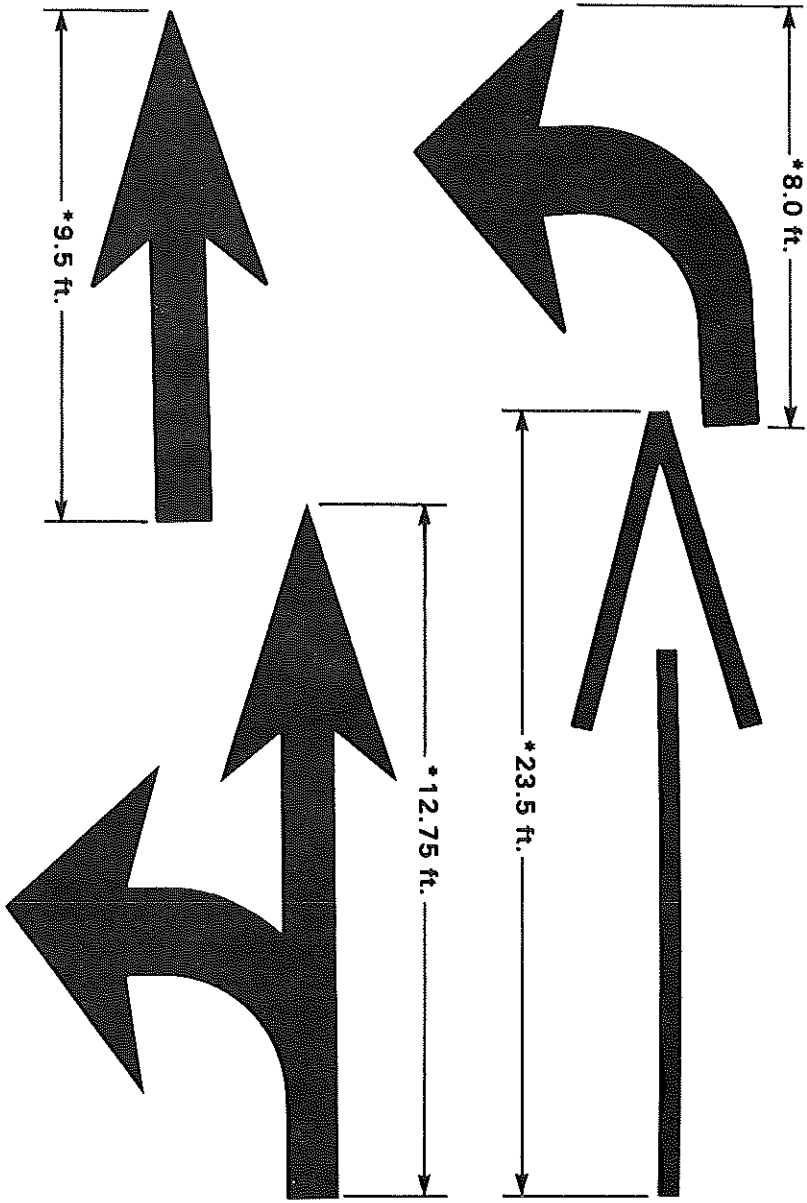


* Minimum sizes for normal installation; larger sizes may be needed for freeways, above average speeds, and other critical conditions. For proper proportion, see Standard Alphabets for Highway Signs and Pavement Markings (available from FHWA, HTO-20, Washington, D.C. 20590).

*Figure 3-18. Elongated arrows for pavement markings.*

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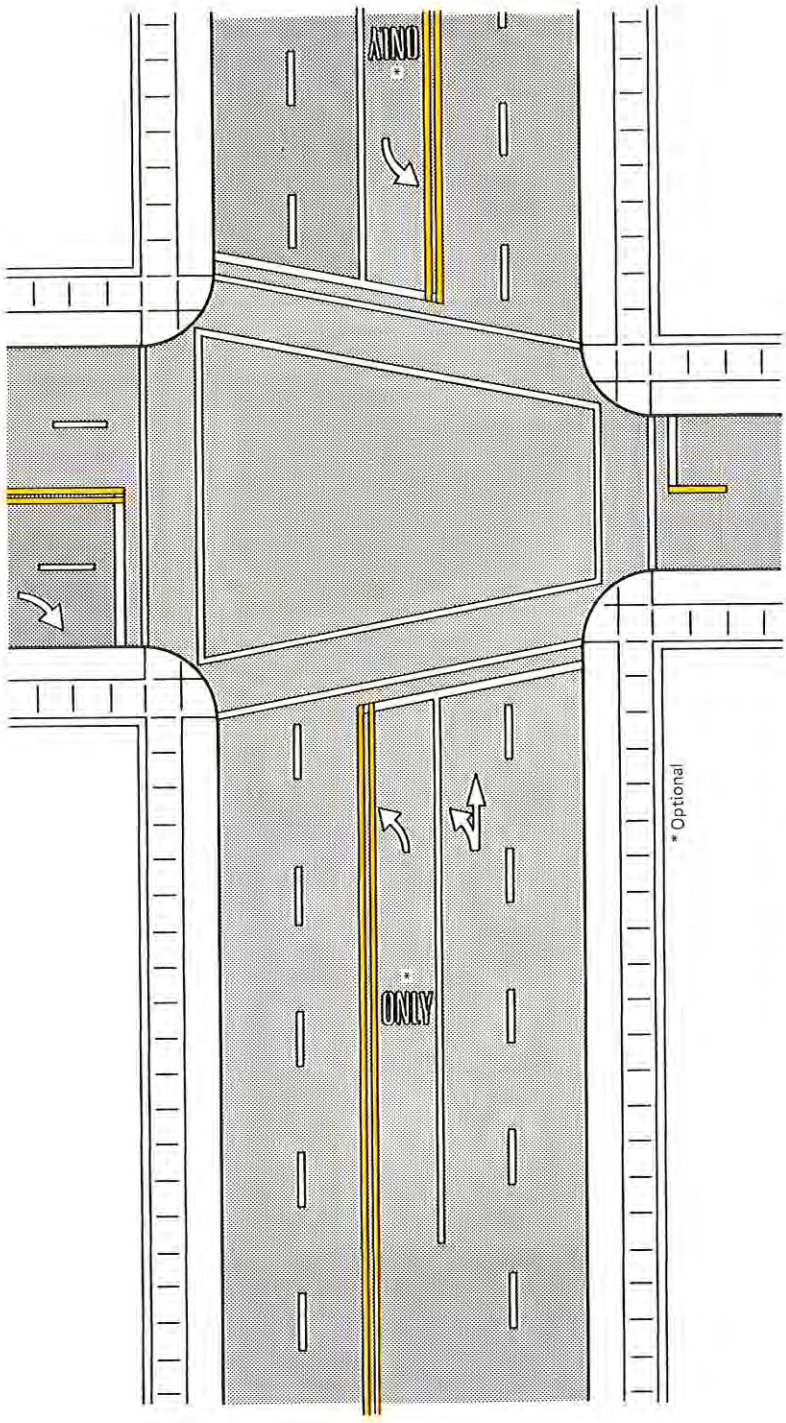


*Figure 3-19. Typical lane-use-control word and symbol markings.*

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The marking is intended to convey that a restriction on the class or classes of vehicles permitted to use the lane exists, and it is supplemental to signs or signals conveying the specific restrictions. Signs or signals shall be used with the preferential lane markings.

The preferential lane marking shall be the elongated diamond detailed in the Standard Alphabets for Highway Signs and Pavement Markings.* The diamond shall be formed by white lines at least 6 inches in width, shall be at least 2 ½ feet in width and 12 feet long and shall be placed coincident with the longitudinal center of each restricted lane.

The frequency with which the marking is placed is a matter for engineering judgment based on prevailing speed, block lengths, distance from intersections, and other considerations necessary to adequately communicate with the driver. Spacing as close as 80 feet may be appropriate for a city street, while a spacing of 1000 feet may be appropriate for a freeway.

Word markings may be used to supplement but not substitute for the preferential lane markings.

### 3B-20 Speed Measurement Markings

A speed measurement marking is a transverse marking placed on the roadway for the purpose of assisting in the enforcement of speed regulations. Speed measurement markings, if used, shall be white, and shall be not greater than 24 inches wide. They may extend approximately 2 feet on either side of the centerline or edgeline of the paved surface at ¼ mile intervals over a 1-mile length of roadway. Advisory signs may be used in conjunction with these markings.

* Available from the Federal Highway Administration (HTO-20), Washington, D.C. 20590.

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## C. OBJECT MARKINGS

### 3C-1 Object Marker Design

Object markers are used to mark obstructions within or adjacent to the roadway. When used, these markers shall consist of an arrangement of one or more of the following designs:

*Type 1*—Either a marker consisting of nine yellow reflectors, each with a minimum dimension of approximately 3″, mounted symmetrically on an 18″ yellow or black diamond panel; or an all yellow reflective diamond panel of the same size. Type 1 markers may be larger if conditions warrant.

*Type 2*—Either a marker consisting of three yellow reflectors, each with a minimum dimension of approximately 3″, arranged either horizontally or vertically; or an all yellow reflective panel, 6″ × 12″. Type 2 markers may be larger if conditions warrant.

*Type 3*—Striped marker consisting of a vertical rectangle approximately 1 foot by 3 feet in size with alternating black and reflectorized yellow stripes sloping downward at an angle of 45° toward the side of the obstruction on which traffic is to pass. The minimum width of the yellow stripe shall be 3 inches. A better appearance can be achieved if the black stripes are wider than the yellow stripes. III-7 (c) Rev. 2

Type 3 object markers with stripes which begin at the upper right side and slope downward to the lower left side are to be designated as "right" object markers (OM-3R). Object markers with stripes which begin at the upper left side and slope downward to the lower right side are to be designated as "left" object markers (OM-3L).

### 3C-1.1 Mounting Height

When used for marking objects in the roadway or 8 feet or less from the shoulder or curb, the mounting height to the bottom of the object marker should normally be 4 feet above the surface of the nearest traffic lane. When used to mark objects more than 8 feet from the shoulder or curb, the mounting height to the bottom of the object marker may be 4 feet above the ground. III-23 (c Rev. 3

When object markers or markings are applied to a hazardous object which by its nature requires a lower or higher mounting, the vertical mounting height may vary according to need.

### 3C-2 Objects in the Roadway

Obstructions within the roadway, shall be marked with a Type 1 or Type 3 object marker.

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For additional emphasis, a large surface such as a bridge pier may be painted with diagonal stripes, 12 inches or greater in width, similar in design to the Type 3 object marker. The alternating black and reflectorized yellow stripes shall be sloped down at an angle of 45° toward the side of the obstruction which traffic is to pass. III-7 (c) Rev. 2

Appropriate signs (secs. 2B-25 and 2C-33) directing traffic to one or both sides of the obstruction may be used in lieu of the object marker. In addition to markings on the face of an obstruction in the roadway, warning of approach to the obstruction shall be given by appropriate pavement markings (sec. 3B-13). III-23 (c) Rev. 3

Where the vertical clearance of an overhead structure exceeds the maximum legal height of vehicle by less than one foot, the clearance in feet and inches should be clearly marked on the structure (sec. 2C-34).

### 3C-3 Objects Adjacent to the Roadway

Objects not actually in the roadway may be so close to the edge of the road that they need a marker. These include underpass piers, bridge abutments, handrails and culvert headwalls. In some cases there may not be a physical object involved, but other roadside conditions such as narrow shoulder drop-offs, gores, small islands and abrupt changes in the roadway alignment may make it undesirable for a driver to leave the roadway. Type 2 or 3 object markers are intended for use at such locations. The inside edge of the marker shall be in line with the inner edge of the obstruction.

Standard warning signs (Part II-C) should also be used where applicable. Typical applications of markers for roadside obstructions are shown in figure 3-20.

### 3C-4 End of Roadway

When it is determined that markers should be placed at the end of a roadway where there is no alternate vehicular path, either a marker consisting of nine red reflectors, each with a minimum dimension of approximately 3", mounted symmetrically on an 18-inch diamond, red or black panel; or an 18-inch diamond reflectorized red panel shall be used. More than one marker or a larger marker may be used at the end of the roadway where conditions warrant. The minimum mounting height of this marker shall be four feet. Appropriate advance warning signs should be used. Editorial Rev. 2 Editorial Rev. 2

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## D. DELINEATION

### 3D-1 Delineators

Road delineators are light-retroreflecting devices mounted at the side of the roadway, in series, to indicate the roadway alignment. Delineators are effective aids for night driving and are to be considered as guidance devices rather than warning devices. Delineators may be used on long continuous sections of highway or through short stretches where there are changes in horizontal alignment, particularly where the alignment might be confusing, or at pavement width transitions. An important advantage of delineators, in certain areas, is that they remain visible when the roadway is wet or snow-covered.

### 3D-2 Design

Delineators shall consist of reflector units capable of clearly reflecting light under normal atmospheric conditions from a distance of 1,000 feet when illuminated by the upper beam of standard automobile lights. Reflective elements for delineators shall have a minimum dimension of approximately 3 inches. Elongated reflective units of appropriate size may be used in place of two reflectors mounted as a unit.

### 3D-3 Curb Markings for Delineation

Reflectorized solid yellow should be placed on the curbs of islands located in the line of traffic flow where the curb serves to channel traffic to the right of the obstruction. Reflectorized solid white should be used when traffic may pass on either side of the island.

Where the curbs of the islands become parallel to the direction of traffic flow it is not necessary to mark the curbs unless a study indicates the need for this type of delineation. Where these curbs are marked, the colors shall conform to the general principles of markings (sec. 3A-5).

Curbs at openings in a continuous median island need not be marked unless individual study indicates the need for this type of marking.

### 3D-4 Delineator Application

Delineation is intended to be a guide to the vehicle operator as to the alignment of the highway; whatever is needed to provide that guidance in a clear and simple way should be installed.

The color of delineators shall, in all cases, conform to the color of edgelines stipulated in section 3B-6.

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Single delineators shall be provided on the right side of expressway and freeway roadways and on at least one side of interchange ramps. They may be provided on other classes of roads.

Single delineators may be provided on the left side of roadways and should be provided on the outside of curves on interchange ramps.

Where median crossovers are provided for official or emergency use on divided highways and where these crossovers are to be marked, a double yellow delineator should be placed on the left side of the through roadway on the far side of the crossover for each roadway.

Double or vertically elongated delineators should be installed at 100-foot intervals along acceleration and deceleration lanes.

Red delineators may be used on the reverse side of any delineator whenever it would be viewed by a motorist traveling in the wrong direction on that particular ramp or roadway.

Delineators of the appropriate color may be used to indicate the narrowing of the pavement where either an outside or inside lane merges into an adjacent lane. The delineators should be used adjacent to the lane affected for the full length of the convergence and should be so placed and spaced to show the width reduction (fig. 3-10, page 3B-13). Delineation is not necessary for the traffic moving in the direction of a wider pavement or on the side of the roadway where the alignment is not affected by the convergence. On a highway with continuous delineation on either or both sides, delineators should be carried through the transition and a closer spacing may be warranted.

Delineation shall be optional on sections of roadway between interchanges where fixed-source lighting is in operation.

When used, delineators shall be red in color and should normally be placed on both sides of truck escape ramps. The delineators should be spaced at 50 feet intervals for a distance sufficient to identify the ramp entrance. Delineator spacing beyond the ramp entrance should be adequate for guidance in accordance with the length and design of the escape ramp. III-24 (c) Rev. 3

### 3D-5 Delineator Placement and Spacing

Delineators, if used, shall be mounted on suitable supports so that the top of the reflecting head is about 4 feet above the near roadway edge. They shall be placed not less than 2 or more than 8 feet outside the outer edge of the shoulder, or if appropriate, in the line of the roadside barrier. III-21 (c) Rev. 3

Delineators should be placed at a constant distance from the edge of the roadway except that, where a guardrail or other obstruction intrudes into the space between the pavement edge and the extension of the line of delineators, the delineators should be in line with or inside the innermost edge of the obstruction. Typical delineator installations are shown in figure 3-20 (page 3C-4).

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III–1 shows suggested spacing for delineators at horizontal curves.

Table III–1 Suggested Spacing for Highway Delineators on Horizontal Curves

(Distance in Feet Rounded to the Nearest 5 Feet)

| Radius of Curve (in feet) | Spacing on Curve (in feet) (S) |
|---|---|
| 50 | 20 |
| 150 | 30 |
| 200 | 35 |
| 250 | 40 |
| 300 | 50 |
| 400 | 55 |
| 500 | 65 |
| 600 | 70 |
| 700 | 75 |
| 800 | 80 |
| 900 | 85 |
| 1,000 | 90 |

Spacing for specific radii not shown may be interpolated from table. The minimum spacing should be 20 feet. The spacing on curves should not exceed 300 feet. In advance of or beyond a curve, and proceeding away from the end of the curve, the spacing of the first delineator is 2S, the second 3S, and the third 6S but not to exceed 300 feet. S refers to the delineator spacing for specific radii computed from the formula $S = 3\sqrt{R-50}$.

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(e) Where turning movements are "protected" from conflicting movements by other indications or by the signal sequence.

(f) Where all the movements on the approach do not begin or end at the same time and where the indications for the turning movements will also be visible to traffic with other allowable movements.

5. Steady arrow indications are used as follows:

(a) A steady YELLOW ARROW indication shall be used following a GREEN ARROW indication which has been displayed simultaneously with a CIRCULAR RED indication in the same signal face. A GREEN ARROW need not be terminated by a displayed interval if a CIRCULAR GREEN permitting the turn to continue on a permissive basis is displayed in the same signal face simultaneously with the GREEN ARROW or immediately following the GREEN ARROW termination. IV-27 (c) Rev. 3

(b) A steady YELLOW ARROW indication shall be used following a GREEN ARROW indication which has been displayed simultaneously with a CIRCULAR RED indication in the same signal face, except in the following case. When a green right turn arrow (or left turn arrow displayed to one-way traffic) is followed immediately by a CIRCULAR GREEN indication shown alone, during which time no prohibitions are in effect for the indicated turn, the yellow arrow display is not desirable.

(c) A steady YELLOW ARROW indication or optional CIRCULAR YELLOW shall follow a GREEN ARROW indication in a signal face which is used exclusively to control a single directional movement.

(d) A steady YELLOW ARROW indication may be used to indicate the clearance interval following the termination of a GREEN ARROW indication which has been displayed simultaneously with a continuing CIRCULAR GREEN indication in the same signal face.

(e) A steady GREEN ARROW indication shall be used only to allow vehicular movements which are completely protected from conflict with other vehicles moving on a green indication or with pedestrians crossing in conformance with a WALK or flashing DONT WALK indication.

(f) A steady left GREEN ARROW indication shall be used as the green display on a signal face which controls an exclusive left turn lane, if that left turn movement is protected by the signal sequence.

(g) A YELLOW ARROW shall not be displayed when any conflicting movement has a CIRCULAR GREEN or CIRCULAR YELLOW. IV-27 (c) Rev. 3

6. The following combinations of signal indications shall not be simultaneously displayed on any one signal face:

(a) CIRCULAR GREEN with CIRCULAR YELLOW

(b) Straight-through GREEN ARROW with CIRCULAR RED. IV-27 (c) Rev. 3

(c) CIRCULAR RED with CIRCULAR YELLOW.

(d) CIRCULAR GREEN with CIRCULAR RED.

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The above combinations shall not be simultaneously displayed in different signal faces on any one approach unless:

(a) One of the faces is a turn signal controlling only an exclusive turn lane and a sign LEFT (or RIGHT) TURN SIGNAL (sec. 4B-12(4)) is located adjacent to each such signal face.

(b) One of the faces is a turn signal controlling only an exclusive turn lane and consists entirely of arrow indications.

(c) The signal faces are shielded, hooded, louvered, positioned or designed so that the combination is not confusing to approaching drivers.

The following signal indications shall not be displayed on any signal face, either alone, or in combination with any other indication: IV-27 (c) Rev. 3

(a) Straight-through RED ARROW

(b) Straight-through YELLOW ARROW

7. When a traffic control signal is put on flashing operation, normally a yellow indication should be used for the major street and a red indication for the other approaches. Yellow indications shall not be used for all approaches. The following applications shall apply whenever signals are placed in flashing operation:

(a) A CIRCULAR YELLOW indication shall be flashed instead of any YELLOW ARROW indication which may be included in that signal face.

(b) No CIRCULAR GREEN or GREEN ARROW indication or flashing yellow indication shall be terminated and immediately followed by a steady red or flashing red indication without the display of the steady yellow change indication; however, transition may be made directly from a CIRCULAR GREEN or GREEN ARROW indication to a flashing yellow indication.

(c) All signal faces on an approach shall flash the same color of circular indication, except that left turn signal indications may be flashed CIRCULAR RED when adequately shielded or positioned so that through traffic on the approach will not be exposed to substantial visual conflict from the left turn signal indications. The flashing yellow signal indication for through traffic does not have to be shielded or positioned to prevent visual conflict for drivers in the left turn lane.

### 4B-7 Number of Lenses per Signal Face

Each signal face, except in pedestrian signals, shall have at least three lenses, but not more than five. The lenses shall be red, yellow or green in color, and shall give a circular or arrow type of indication. Allowable exceptions to the above are:

1. Where a single section green arrow lens is used alone to indicate a continuous movement. IV-27 (c) Re

2. As discussed under Unexpected Conflicts During Green or Yellow Interval (sec. 4B-16).

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3. Where one or more indications are repeated for reasons of safety or impact.

4. Where a variable indication signal section is used to display alternately a green arrow and a yellow arrow.

### 4B-8 Size and Design of Signal Lenses

The aspect of all signal lenses, except in pedestrian signals, shall be circular. There shall be two sizes for lenses, 8 inches and 12 inches nominal diameter.

Twelve-inch lenses normally should be used:

1. For intersections with 85 percentile approach speeds exceeding 40 mph.

2. For intersections where signalization might be unexpected.

3. For special problem locations, such as those with conflicting or competing background lighting.

4. For intersections where drivers may view both traffic control and lane-direction-control signs simultaneously.

5. For all arrow indications.

6. For signals located more than 120 feet from the stop sign line. (See Section 4B-12, 10)

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Arrows shall be pointed vertically upward to indicate a straight-through movement and in a horizontal direction to indicate a turn at approximately right angles. When the angle of the turn is substantially different from a right angle, the arrow should be positioned on an upward slope at an angle approximately equal to that of the turn.

Each arrow lens shall show only one arrow direction. The alternate display of two arrow indications in the same lens, a green arrow or a yellow arrow, shall be permitted. The arrow shall be the only illuminated part of the lens visible.

In no case shall letters or numbers be displayed as part of a vehicular signal indication.

Except for the requirements of this section, all lenses shall conform to the Standard for Adjustable Face Vehicle Traffic Control Signal Heads, 1977 Edition. *

### 4B-9 Arrangement of Lenses in Signal Faces

The lenses in a signal face shall be arranged in a vertical or horizontal straight line, except that in a vertical array, lenses of the same color may be arranged horizontally adjacent to each other at right angles to the basic straight line arrangement (fig. 4-1). Such clusters shall be limited to two identical lenses or to two or three different lenses of the same color.

* Available from the Institute of Transportation Engineers, see page iii.

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In each signal face, all red lenses in vertical signals shall be located above, and in horizontal signals shall be located to the left of all yellow and green lenses.

A CIRCULAR YELLOW lens shall be located between the red lens or lenses and all other lenses.

In vertically arranged signal faces, each YELLOW ARROW lens shall be located immediately above the GREEN ARROW lens to which it applies. When a variable indication arrow lens (capable of showing either a green or a yellow arrow) is used, the lenses shall be in the same position relative to other lenses as are the GREEN ARROW lenses in a vertical signal face.

In horizontally arranged signals, the YELLOW ARROW lens shall be located immediately to the left of the GREEN ARROW lens. When a variable indication arrow lens (a green arrow and a yellow arrow) is used, the LEFT TURN ARROW lens shall be located immediately to the right of the CIRCULAR YELLOW lens, the STRAIGHT THROUGH ARROW lens shall be located immediately to the right of the CIRCULAR GREEN lens, and the RIGHT TURN ARROW lens shall be located to the right of all other lenses.

The relative positions of lenses within the signal face shall be as follows:

1. In a vertical signal face from top to bottom:

CIRCULAR RED
Left turn RED ARROW
Right turn RED ARROW
CIRCULAR YELLOW
CIRCULAR GREEN
Straight through GREEN ARROW
Left turn YELLOW ARROW
Left turn GREEN ARROW
Right turn YELLOW ARROW
Right turn GREEN ARROW

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The location of the CIRCULAR GREEN below the Straight Through GREEN ARROW is an acceptable alternative, although the position of the CIRCULAR GREEN shown in the above tabulation is preferred.

2. In a horizontal signal face from left to right:

CIRCULAR RED
Left turn RED ARROW
Right turn RED ARROW

CIRCULAR YELLOW
Left turn YELLOW ARROW
Left turn GREEN ARROW

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CIRCULAR GREEN
Straight through GREEN ARROW
Right turn YELLOW ARROW
Right turn GREEN ARROW

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3. In a cluster, identical signal indications may be repeated in adjacent vertical or horizontal locations within the same signal face. If adjacent indications in a cluster are not identical, their arrangement shall follow paragraph 1 or 2 above, as applicable.

Basic horizontal and vertical display faces may be used on the same approach provided they are separated to meet the lateral clearance required in section 4B-12.

Figure 4-1 shows more possible arrangements of lenses in signal faces.

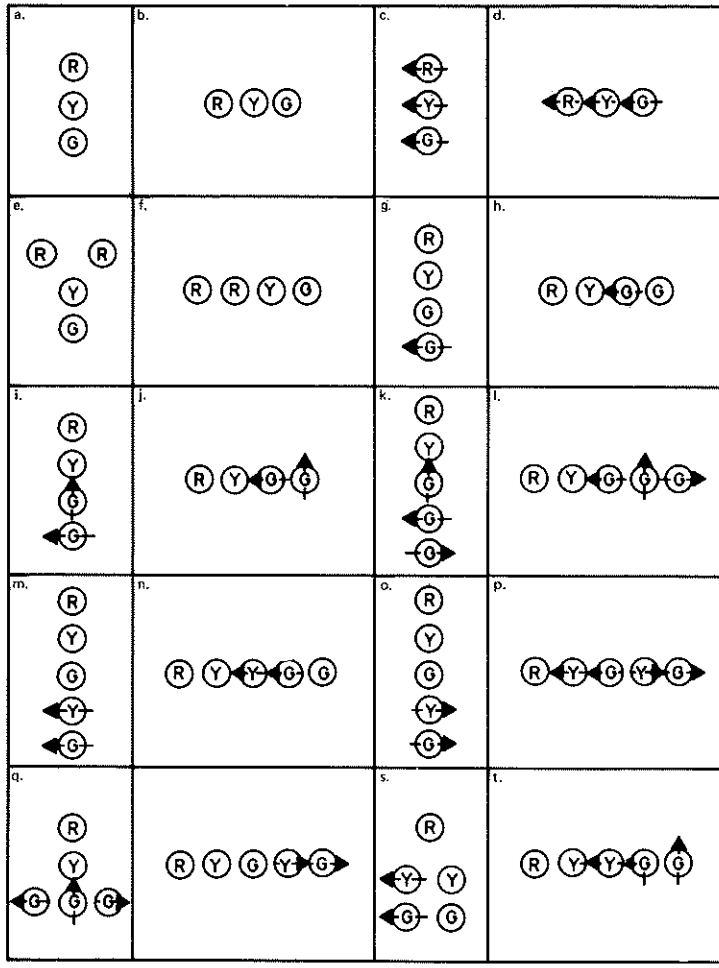


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*Figure 4-1. Typical arrangements of lenses in signal faces.*

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**4B-10 Illumination of Lenses**

Each signal lens shall be illuminated independently.

When a signal lens, except in a pedestrian signal, is illuminated and the view of such an indication is not otherwise physically obstructed, it shall be clearly visible (to drivers it controls) for a distance of at least ¼ mile under normal atmospheric conditions.

The intensity and distribution of light from each illuminated signal lens should conform to the current editions of A Standard for Adjustable Face Vehicle Traffic Control Heads *, and A Standard for Traffic Signal Lamps *.

When 12-inch signals with 150 watt lamps are placed on flashing for nighttime operation and the flashing yellow indication is so bright as to cause excessive glare, an automatic dimming device should be used to reduce the brilliance of the flashing 12-inch yellow.

**4B-11 Visibility and Shielding of Signal Faces**

Each signal face shall be so adjusted that its indications will be of maximum effectiveness to the approaching traffic for which they are intended.

Visors should be used on all signal faces to aid in directing the signal indication specifically to approaching traffic, as well as to reduce "sun phantom" resulting from external light entering the lens. A back-plate is a strip of thin material which extends outward parallel to the signal face, on all sides of the signal housing. Back-plates normally should be aimed to have effectiveness for an approaching driver located a distance from the stop line equal to the distance traversed while stopping. This distance should include that covered while reacting to the signal as well as that covered while bringing the vehicle to a stop from an average approach speed. The influence of curves, grades, and obstructions should be considered in directing and locating signals.

In general, vehicular signal faces should be aimed to have effectiveness for and approaching driver located a distance from the stop line equal to the distance traversed while stopping. This distance should include that covered while reacting to the signal as well as that covered while bringing the vehicle to a stop from an average approach speed. The influence of curves, grades, and obstructions should be considered in directing and locating signals.

Irregular street design frequently necessitates placing signals for different street approaches with a comparatively small angle between their indications. In these cases, each signal indication shall, to the extent practicable, be shielded or directed by visors, louvers, or other means so that an approaching driver can see only the indication controlling his movement. Tunnel visors exceeding 12 inches in length shall not be used on free-swinging signals.

* Available from the Institute of Transportation Engineers, see page iii.

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the signal faces required by paragraph (1) above shall be located between two lines intersecting with the center of the approach lanes at the stop line, one making an angle of approximately 20 degrees to the right of the center of the approach extended, and the other making an angle of approximately 20 degrees to the left of the center of the approach extended (fig. 4-2). This requirement is to be applied simultaneously with paragraph (5) above.

7. Near-side signals should be located as near as practicable to the stop line.

8. Where a signal face controls a specific lane or lanes of approach, its transverse position should be unmistakably in line with the path of that movement.

9. Required signal faces for any one approach shall be not less than 8 feet apart measured horizontally between centers of faces.

10. When the nearest signal face is more than 120 feet and less than 150 feet beyond the stop line, either 12-inch signal indications or a near-side signal indication shall be used. When the nearest signal face is 150 feet or more beyond the stop line, a supplemental near-side signal face shall be used. IV-21 (c) Rev. 2

11. A signal face mounted on a span wire or mast arm should be located as near as practicable to the line of the driver's normal view.

12. Supplemental signal faces should be used when an engineering study has shown that they are needed to achieve both advance and immediate intersection visibility. When used, they should be located to provide optimum visibility for the movement to be controlled. The following limitations apply:

(a) Left turn arrows shall not be used in near-right faces.

(b) Right turn arrows shall not be used in far-left faces. A far-side median mount signal shall be considered as a far-left signal for this application.

At signalized mid-block crosswalks, there should be at least one signal face over the traveled roadway for each approach. In other respects, a traffic control signal at a mid-block location shall meet the requirements set forth herein.

The transverse location of a signal face, shall, if mounted on the top of a post or on a short bracket from it, conform with section 4B-14.

Supplementary pedestrian signals shall be used where warranted as provided in section 4D-3.

If a signal face(s) displays control for a particular vehicular movement during any interval of a sequence, it must display control for that same movement during all intervals of the sequence. IV-27 (c) Rev. 3

### 4B-13 Height of Signal Faces

The bottom of the housing of a signal face, not mounted over a roadway, shall not be less than 8 feet nor more than 15 feet above the

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sidewalk or, if none, above the pavement grade at the center of the highway, except that the bottom of center median, near-side signal faces may be mounted at a minimum of 4½ feet above the median island grade.

The bottom of the housing of a signal face suspended over a roadway shall not be less than 15 feet nor more than 19 feet above the pavement grade at the center of the roadway.

Within the above limits, optimum visibility and adequate clearance should be the guiding considerations in deciding signal height. Grades on approaching streets may be important factors, and should be considered in determining the most appropriate height.

### 4B-14 Transverse Location of Traffic Signal Supports and Controller Cabinets

In the placement of signal supports, primary consideration shall be given to ensuring the proper visibility of signal faces as described in sections 4B-12 and 13. However, in the interest of safety, signal supports and controller cabinets should be placed as far as practicable from the edge of the traveled way without adversely affecting signal visibility.

Supports for post-mounted signal heads at the side of a street with curbs shall have a horizontal clearance of not less than 2 feet from the face of a vertical curb. Where there is no curb, supports for post-mounted signal heads shall have a horizontal clearance of not less than 2 feet from the edge of a shoulder, within the limits of normal vertical clearance. A signal support should not obstruct a crosswalk.

No part of a concrete base for a signal support should extend more than 4 inches above the ground level at any point, except that this limitation does not apply to the concrete base for a rigid (non-breakaway) support.

On medians, the above minimum clearances for signal supports should be obtained where practicable. Any supports which cannot be located with the required clearances should be of the breakaway type or should be guarded if at all practicable.

### 4B-15 Vehicle Change Interval

A yellow vehicle change interval shall be used, where applicable, following each CIRCULAR GREEN or GREEN ARROW interval, as discussed in section 4B-6(2) and (4). In no case shall a CIRCULAR YELLOW indication be displayed in conjunction with the change from CIRCULAR RED to CIRCULAR GREEN.

The exclusive function of the steady yellow interval shall be to warn traffic of an impending change in the right-of-way assignment.

Yellow vehicle change intervals should have a range of approximately 3 to 6 seconds. Generally the longer intervals are appropriate to higher approach speeds.

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The yellow vehicle change interval may be followed by a short all-way red clearance interval, of sufficient duration to permit the intersection to clear before cross traffic is released.

A clearance interval shall be provided between the termination of a GREEN ARROW indication and the showing of a green indication to any conflicting traffic movement.

A YELLOW ARROW shall not be terminated by a GREEN ARROW. It may be terminated by a CIRCULAR GREEN if the movement controlled by the arrow is to continue on a permissive basis, or by a CIRCULAR YELLOW, CIRCULAR RED, or RED ARROW. IV-27 (c) Rev. 3

**4B-16 Unexpected Conflicts During Green or Yellow Interval**

No movement that may involve an unexpected crossing of pathways of moving traffic should be indicated during any green or yellow interval, except when: IV-27 (c) Rev. 3

1. The movement involves only slight hazard;

2. Serious traffic delays are materially reduced by permitting the conflicting movement; and

3. Drivers and pedestrians subjected to the unexpected conflict are effectively warned thereof.

When such conditions of possible unexpected conflict exist, warning may be given by a sign or by the use of an appropriate signal indication as set forth in section 4B-7. The foregoing applies to vehicle-pedestrian conflicts as well as to vehicle-vehicle conflicts.

**4B-17 Coordination of Traffic Control Signals**

Traffic control signals within ½ mile of one another along a major route or in a network of intersecting major routes should be operated in coordination, preferably with interconnected controllers. However, coordination need not be maintained across boundaries between signal systems which operate on different time cycles. Coordinated operation normally should include both pre-timed signals and traffic-actuated signals within the appropriate distances.

For coordination with railroad grade crossings signals see section 8C-6.

**4B-18 Flashing Operation of Traffic Control Signals**

All traffic signal installations shall be provided with an electrical flashing mechanism supplementary to the signal timer. A manual switch, or where appropriate, automatic means, shall be provided to actuate the flashing mechanism. The signal timer shall be removable without affecting the flashing operation. The mechanism shall operate in a manner similar

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to that of an Intersection Control Beacon (sec. 4E-3) to provide intermittent illumination of selected signal lenses.

The illuminating element in a flashing signal shall be flashed continuously at a rate of not less than 50 nor more than 60 times per minute. The illuminated period of each flash shall be not less than half and not more than two-thirds of the total flash cycle.

When traffic control signals are put on flashing operation, the signal indications given to the several streets shall be as specified in section 4B-6(7).

Automatic changes from flashing to stop-and-go operation shall be made at the beginning of the major street green interval, preferably at the beginning of the common major street green interval, (i.e., when a green indication is shown in both directions on the major street). Automatic changes from stop-and-go to flashing red interval, (i.e., when a red indication is shown in both directions on the major street).

The change from the flashing to stop-and-go operation, or from stop-and-go to flashing operation by manual switch may be made at any time.

Where there is no common major street green interval, the automatic change from flashing to stop-and-go operation shall be made at the beginning of the green interval for the major traffic movement on the major street. It may be necessary to provide a short, steady all-red interval for the other approaches before changing from flashing yellow or flashing red to green on the major approach.

### 4B-19 Continuity of Operation

A traffic signal installation, except as provided below, shall be operated as a stop-and-go device or as a flashing device.

When a signal installation is not in operation, such as prior to placing it in service, during seasonal shutdowns, or when it is not desirable to operate the signals, they should be hooded, turned or taken down to clearly indicate that the signal is not in operation.

When a traffic signal installation is being operated in the usual (stop-and-go) manner, at least one indication in each signal face shall be illuminated.

When a traffic signal is being operated as a flashing device, all signal faces on an approach shall be flashed.

The above provisions do not apply to emergency traffic signals, movable bridge signals or ramp control signals.

When a single-section, continuously illuminated GREEN ARROW lens is used alone to indicate a continuous movement, it may be continuously illuminated when the other signal indications in the signal installation are flashed.

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### 4B-20 Signal Operation Must Relate to Traffic Flow

Traffic control signals shall be operated in a manner consistent with traffic requirements. Data from engineering studies shall be used to determine the proper phasing and timing for a signal.

Since traffic flows and patterns change, it is necessary that the engineering data be updated and re-evaluated regularly.

To assure that the approved operating pattern including timing is displayed to the driver, regular checks including the use of accurate timing devices should be made.

### 4B-21 Traffic Signals Near Grade Crossings

When a railroad-highway grade crossing with active traffic control devices is within or near a highway intersection controlled by traffic control signals, the two signal systems should be interconnected as provided in section 8C-6.

### 4B-22 Priority Control of Traffic Signals

Traffic control signals may be modified in timing, sequence, or display to grant priority control to authorized special classes of vehicles, (such as emergency, transit, construction, trains, boats, etc.). When the display of a traffic control signal is modified to grant priority control, change or clearance intervals shall be provided (4B-15, 4D-7). A distinctive indication may be provided at the intersection to show that an emergency vehicle has achieved control of the traffic signal (Uniform Vehicle Code 11-106).

Priority control of traffic signals may also be applicable in specialized nonintersection locations as a means of assigning priority right-of-way to specified classes of vehicles (such as on the approaches to one-lane bridges and tunnels, drawbridges, highway maintenance and construction activities, metered freeway entrance ramps, and transit operations).

Traffic signals operating under priority assignment should be operated in a manner designed to keep traffic moving. Prolonged all-red or flashing signal sequences are to be avoided.

When a priority sequence is initiated, the display may proceed from steady yellow to steady green. This exception does not apply to the termination of priority or to any display during priority operation.

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### 4B-23 Maintenance of Traffic Control Signals

Prior to the installation of any traffic control signal, the responsibility for its maintenance should be clearly established. The responsible agency should provide for the maintenance of the signal and all of its appurtenances in a responsible manner. To this end the agency should:

1. Provide for alternate operation of the signal during a period of failure, either on flash or manually, or by having manual traffic direction

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by proper authority as may be warranted by traffic volumes or congestion, or by erecting other traffic control devices.

2. Have properly skilled maintenance available without undue delay for all emergency calls, including lamp failures.

3. Provide properly skilled maintenance for all components.

4. Maintain the appearance of the installation in a manner consistent with the intention of this Manual, with particular emphasis on painting and on cleaning of the optical system.

5. Service equipment and lamps as frequently as experience proves necessary to prevent undue failures.

6. Provide adequate stand-by equipment to minimize the interruption of signal operation due to equipment failure.

Every controller should be kept in effective operation in strict accordance with its predetermined timing schedule.

A careful check of the correctness of time operation of the controller should be made frequently enough to insure its operating in accordance with the planned timing schedule. Timing changes should be made only by authorized persons. A written record should be made of all timing changes.

Controllers should be carefully cleaned and serviced at least as frequently as specified by the manufacturer and more frequently if experience proves it necessary.

### 4B-24 Painting

The insides of visors (hoods) and the entire surface of louvers, and fins, and the front surface of backplates shall have a dull black finish to minimize light reflection to the side of the signals.

To obtain the best possible contrast with the visual background, it is desirable to paint signal head housings highway yellow.

### 4B-25 Vehicle Detectors

The placement of vehicle detectors in the roadway in relation to the Stop line is a very important factor in the proper operation of traffic-actuated signals and should be a factor in signal design.

Where the total entering traffic on one street is more than twice that on the cross street, detectors on the cross street should be placed closer to the stop line than on the main street.

Additional "ceiling" detectors may be required on lower volume streets to handle traffic entering the street from driveways between the basic detector and the Stop line.

The transverse placement of detectors should be such that vehicles traveling away from the intersection do not register "false-calls." On narrow two-way roadways this may require use of directional detectors.

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### 4B-26 Auxiliary Signs

Signal instruction signs (sec. 2B-37) used with traffic signals should be located adjacent to the signal face to which they apply. Minimum clearance of the total assembly shall conform to the provisions of sections 2A-23 and 4B-13.

Stop signs shall not be used in conjunction with any signal operation, except:

1. When the indication flashes red at all times or
2. When a minor street or driveway is located within or adjacent to the controlled area, but does not warrant separate signal control due to extremely low potential for conflict.

When used in conjunction with traffic signals, illuminated signs shall be designed and mounted in such a manner as to avoid glare and reflections that seriously detract from the signal indications. The traffic control signal shall be given dominant position and brightness to assure its target priority in the overall display.

Traffic Signal Speed signs (sec. 2D-48) may be used to inform drivers of the speed of progression in effect on streets in the signal system.

### 4B-27 Removal of Confusing Advertising Lights

There should be legal authority to prohibit the display of any unauthorized sign, signal, marking, or device which interferes with the effectiveness of any official traffic control device. Specific reference is made to Section 11-205, Uniform Vehicle Code (1968, Supp. II 1976).

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At least one signal face should be located over the roadway.

A sign, legible at all times, bearing the legend EMERGENCY SIGNAL should be mounted adjacent to each signal face.

A Hazard Identification Beacon may be installed in advance of an emergency-traffic signal. Such beacon shall be accompanied by an appropriate warning sign. The design and location of the beacon shall conform to the standards specified in sections 4E-1 and 4E-5.

A minimum of one signal face shall face the direction of approach of the emergency vehicle.

### 4E-21 Operation of Emergency-Traffic Signals

As a minimum, the indications, sequence and manner of operation of an emergency traffic control signal installed at a mid-block location shall be as follows:

1. The signal indication, between emergency vehicle actuations, shall be either a steady green or flashing yellow. When used in lieu of the steady green, the flashing yellow shall be displayed in the normal position of the steady green while the red and steady yellow will be displayed in their normal positions.
2. There shall always be a steady yellow change indication shown to traffic on the street, but a change indication is not required for the emergency vehicle driveway.
3. There shall be a steady red signal indication for traffic on the street. The duration of the red period should be determined on the basis of on-site test run-time studies, but should normally not exceed 1.5 times the emergency vehicle passage or clearance time.
4. It has been found advantageous to use the following size lenses: 12-inch diameter for red and steady yellow indications, and 8-inch diameter for flashing yellow indications and steady green indications. Other appropriate means to reduce the flashing yellow light output may be used.

An intersectional or mid-block emergency-traffic signal may be actuated manually from a local control point such as a fire station, police headquarters or civil defense office, or from an emergency vehicle equipped for remote operation of the signal.

Hazard Identification Beacons, used with an emergency-traffic signal, shall be actuated from a non-illuminated condition at the same time as the emergency-traffic signal is changed to steady yellow.

Emergency-traffic signals located at intersections should be operated either in the flashing mode between emergency actuations (sec. 4B-18) or should be semi- or fully traffic-actuated, to accommodate normal vehicular and pedestrian traffic on the streets.

### 4E-22 Traffic Signals at Freeway Entrance Ramps

Traffic control signals may be installed on freeway entrance ramps to control the flow of traffic entering the freeway facility. Except as noted

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herein, these ramp control signals shall meet all of the standard design specifications for traffic control signals.

1. The standard display for freeway entrance ramp control signals shall be either a two-indication signal face containing red and green lenses or a standard three-indication signal face containing red, yellow, and green lenses.

2. There shall be a minimum of two signal faces per ramp facing entering traffic.

3. On entrance ramps having more than one lane there shall be a signal face mounted on the left side and on the right side.

4. The required signal faces should be mounted such that the height to the bottom of the housing of the lowest signal face is between 4 ½ and 6 feet. The height of any supplemental signal faces should be consistent with sound design principles and engineering judgment within the limitations provided in section 4B-13.

5. All ramp control signals shall utilize vertically aligned lenses with a minimum nominal diameter of 8 inches.

6. Ramp control signals need not be illuminated when not in use.

### 4E-23 Guidelines for Freeway Entrance Ramp Control Signals

There are too many variables that influence freeway capacity (number of lanes, trucks, gradients, merging, weather, etc.) to permit developing numerical volume warrants that are applicable to the wide variety of conditions found in practice. However, general guidelines have been identified for successful application of ramp control.

The installation of ramp control signals should be preceded by an engineering analysis of the physical and traffic conditions on the highway facilities likely to be affected. The study should include the ramps and ramp connections and the surface streets which would be affected by the ramp control, as well as the freeway section concerned. Types of traffic data which should be obtained include, but are not limited to traffic volumes, traffic accidents, freeway operating speeds, travel time and delay on the freeway and on alternate surface routes.

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Capacities and demand/capacity relationships should be determined for each freeway section. The locations and causes of capacity restrictions and those sections where demand exceeds capacity should be identified. From these and other data, estimates can be made of desirable metering rates, probable reductions in delay of freeway traffic, likely increases in delay to traffic on ramps, and the potential impact on surface streets. The analysis should include an evaluation of storage capacities on the ramp for vehicles delayed at the signal, the impact of quened traffic on the local street intersection, and the availability of suitable alternate surface routes having adequate capacity to accommodate any additional traffic volume.

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Before installing ramp control signals, consideration should be given to public acceptance potential and enforcement requirements of ramp control, as well as alternate means of increasing the capacity, reducing the demand, or improving characteristics of the freeway.

Installation of freeway entrance ramp control signals may be justified when the total expected delay to traffic in the freeway corridor, including freeway ramps and local streets, is expected to be reduced with ramp control signals and when at least one of the following instances occurs:

1. There is recurring congestion on the freeway due to traffic demand in excess of the capacity; or there is recurring congestion or a severe accident hazard at the freeway entrance because of inadequate ramp merging area. A good measure of recurring freeway congestion is freeway operating speed. An early indication of a developing congestion pattern would be freeway operating speeds less than 50 mph, occurring regularly for a period of half an hour. Freeway operating speeds less than 30 mph for a half-hour period would be an indication of severe congestion.

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2. The signals are needed to accomplish transportation system management objectives identified locally for freeway traffic flow, such as:

   (a) maintenance of a specific freeway level of service, or (b) priority treatments with higher levels of service, for mass transit and carpools.

3. The signals are needed to reduce (predictable) sporadic congestion on isolated sections of freeway caused by short-period peak traffic loads from special events of from severe peak loads of recreational traffic.

### 4E-24 Traffic Signals for One-Lane, Two-Way Facilities

A traffic signal for control of traffic at a narrow bridge or tunnel is a special adaptation of a signal to assign right-of-way for vehicles passing over a bridge or through a tunnel which is not sufficient in width for two opposing vehicles to meet and pass safely. A narrow bridge or tunnel signal may be installed at locations that do not meet the warrants prescribed for the various types of other traffic signal installations.

### 4E-25 Applications of One-Lane Bridge or Tunnel Signals

At an unsignalized location, a signal may be justified if gaps in opposing traffic do not permit safe operation of traffic flow through the one-lane section of roadway. Sight distance across or through the structure must also be considered as well as the approach speed and sight distance approaching the bridge or tunnel.

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### 4E-26 Design of Bridge and Tunnel Signals

The signal heads and mounting of the narrow bridge or tunnel signal shall follow the standard design specifications for traffic control signals.

Nominal 8-inch signal indications are standard; however, if prevailing approach speeds are in excess of 40 mph or when considerations, such as roadway width or geometrics, signal locations with conflicting lights or objects in the background, etc., indicate the need for greater signal effectiveness, signal heads with 12-inch diameter lenses and 100 watt or larger lamps should be provided.

Visibility for each approach signal shall be provided and should be continuously visible from a point at least the following distances in advance of and to the stop line, unless physical obstruction of their visibility exists:

| *85 percentile Speed (mph)* | *Minimum Visibility Distance (ft)* |
|---|---|
| 20 | 100 |
| 25 | 175 |
| 30 | 250 |
| 35 | 325 |
| 40 | 400 |
| 45 | 475 |
| 50 | 550 |
| 55 | 625 |
| 60 | 700 |

Where physical conditions prevent drivers from having a continuous view of at least two signal indications as specified herein, a suitable sign shall be erected to warn approaching traffic. It may be supplemented by a Hazard Identification Beacon (sec. 4E-1). A beacon utilized in this manner may be interconnected with the traffic signal controller in such a manner as to flash yellow during the period when drivers passing this beacon, at the legal speed for the roadway, may encounter a red signal upon arrival at the signalized location.

### 4E-27 Location of Narrow Bridge or Tunnel Signals

Two signal indications shall be provided for each approach to the bridge or tunnel. One signal shall be at the left or over the left half of the roadway and the other at the right or over the right half of the roadway.

Insofar as is practical, the height and lateral placement of the signal should conform to the requirements for other traffic control signals. The signal should ordinarily be from 40 to 120 feet beyond the stop bar position.

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### 4E-28 Operation of Narrow Bridge or Tunnel Signals

Signals at narrow bridges or tunnels shall operate in a manner consistent with traffic requirements, except that an adequate clearance must be provided to allow the structure to clear before the opposing traffic is allowed to move.

Data from engineering studies shall be used to determine the proper timing for the signal.

Since traffic flows and patterns change, it is necessary that the engineering data be updated and reevaluated regularly.

To assure that the approved operation timing is correct, regular checks, including the use of accurate timing devices, should be made.

When required for flashing operations, the signals shall be flashed red.

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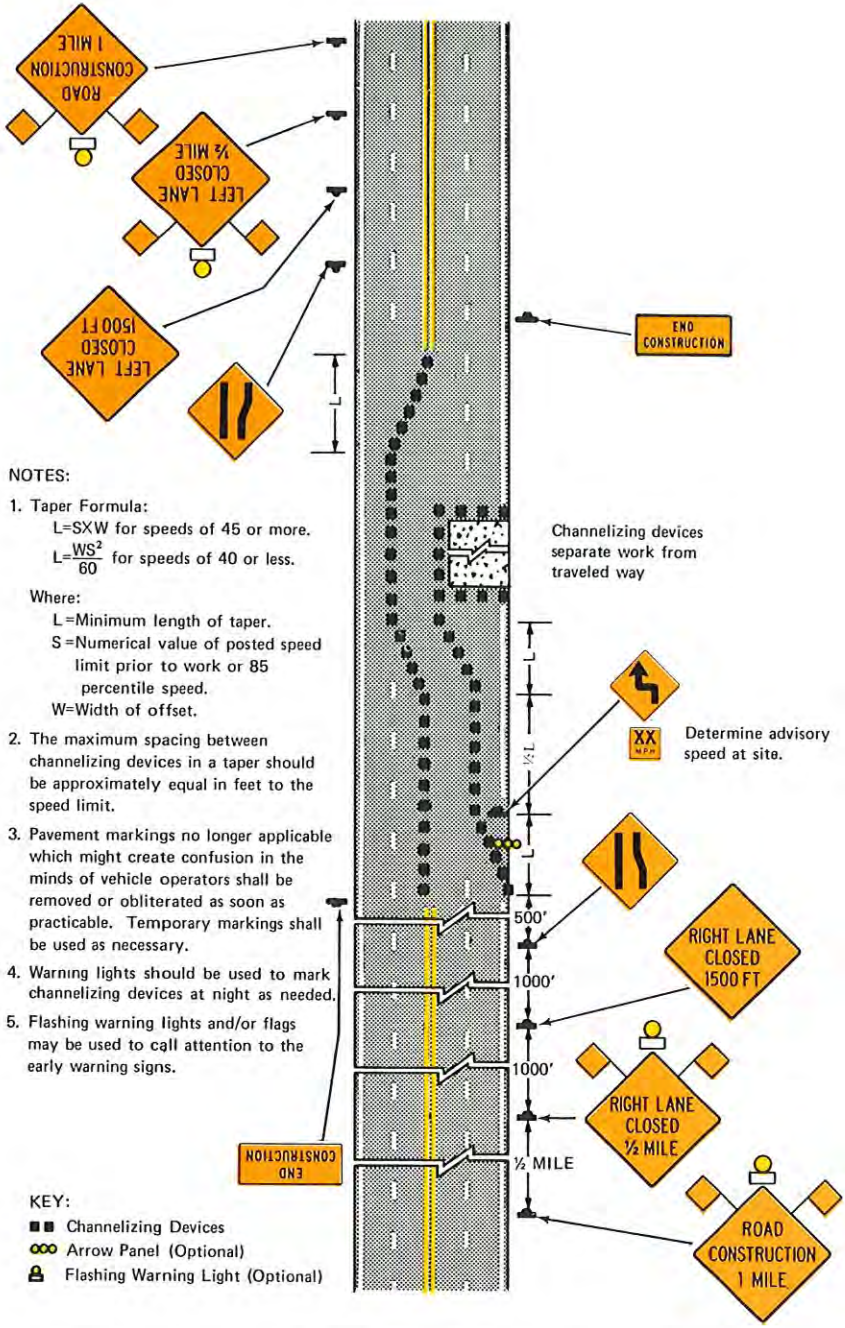
ROAD CONSTRUCTION 1 MILE
LEFT LANE CLOSED ½ MILE
LEFT LANE CLOSED 1500 FT
END CONSTRUCTION
L
Channelizing devices separate work from traveled way
L
½L
L
XX MPH
Determine advisory speed at site.
500'
1000'
1000'
½ MILE
RIGHT LANE CLOSED 1500 FT
RIGHT LANE CLOSED ½ MILE
ROAD CONSTRUCTION 1 MILE
END CONSTRUCTION
NOTES:
1. Taper Formula:
L=SXW for speeds of 45 or more.
L=WS²/60 for speeds of 40 or less.
Where:
L=Minimum length of taper.
S=Numerical value of posted speed limit prior to work or 85 percentile speed.
W=Width of offset.
2. The maximum spacing between channelizing devices in a taper should be approximately equal in feet to the speed limit.
3. Pavement markings no longer applicable which might create confusion in the minds of vehicle operators shall be removed or obliterated as soon as practicable. Temporary markings shall be used as necessary.
4. Warning lights should be used to mark channelizing devices at night as needed.
5. Flashing warning lights and/or flags may be used to call attention to the early warning signs.
KEY:
Channelizing Devices
Arrow Panel (Optional)
Flashing Warning Light (Optional)

***Figure 6-7. Typical application—4-lane undivided roadway, where half the roadway is closed.***

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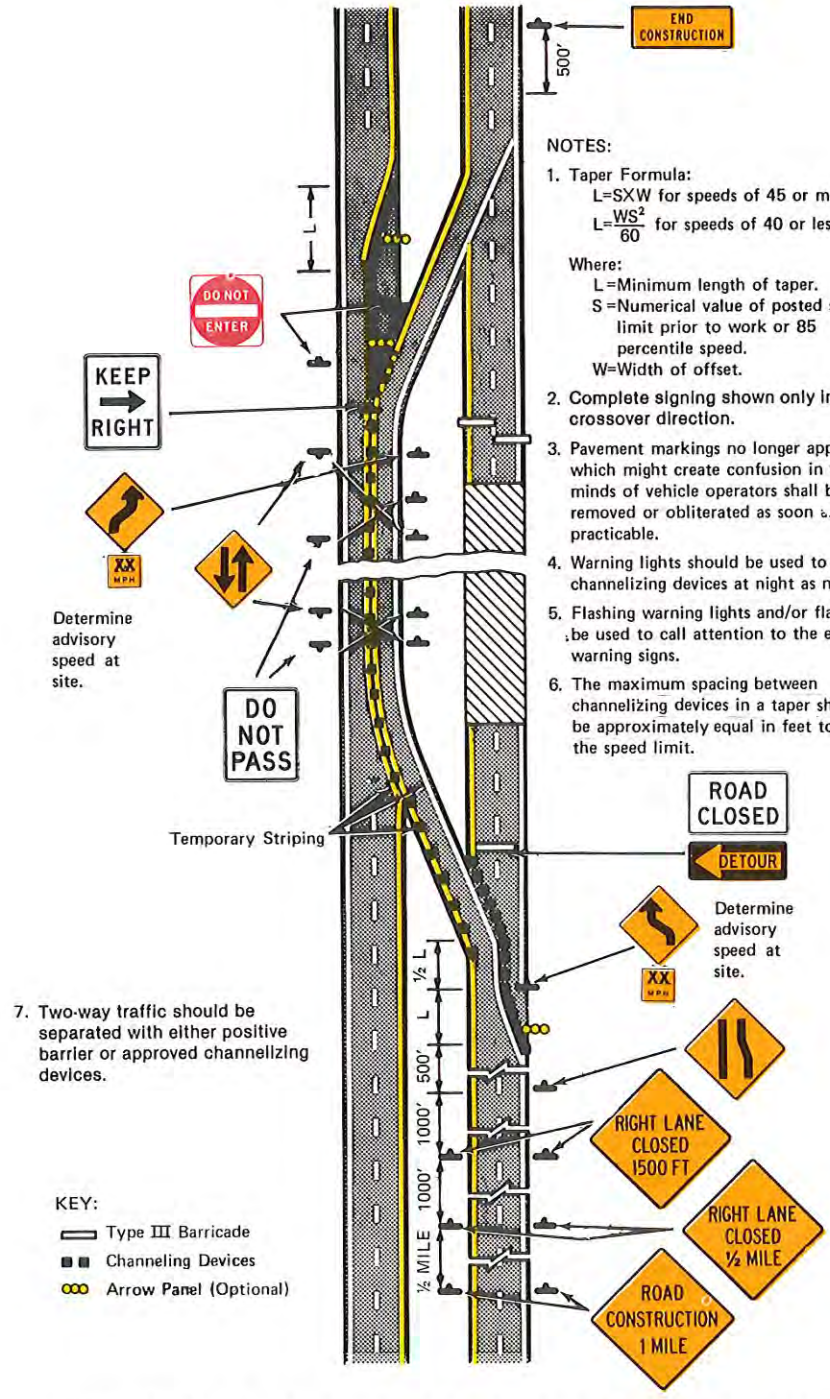


NOTES:

1. Taper Formula:
   L=SXW for speeds of 45 or more.
   $L=\frac{WS^2}{60}$ for speeds of 40 or less.
   Where:
   L=Minimum length of taper.
   S=Numerical value of posted speed limit prior to work or 85 percentile speed.
   W=Width of offset.
2. Complete signing shown only in the crossover direction.
3. Pavement markings no longer applicable which might create confusion in the minds of vehicle operators shall be removed or obliterated as soon as practicable.
4. Warning lights should be used to mark channelizing devices at night as needed.
5. Flashing warning lights and/or flags may be used to call attention to the early warning signs.
6. The maximum spacing between channelizing devices in a taper should be approximately equal in feet to the speed limit.
7. Two-way traffic should be separated with either positive barrier or approved channelizing devices.

*Figure 6-8. Typical application—4-lane divided roadway where one roadway is closed.*

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## E. Lighting Devices

### 6E-1 Function

Construction and maintenance activities often create conditions on or near the traveled way that are particularly hazardous at night when drivers' visibility is sharply reduced. It is often desirable and necessary to supplement the reflectorized signs, barriers and channelizing devices with lighting devices that are described in the following paragraphs.

Three types of electric lights are commonly used: floodlights, steady-burning lights, and flashing lights.

### 6E-2 Floodlights

On construction projects, floodlights have a limited, but important application. Sometimes large construction contracts are prosecuted on a double shift basis, particularly earth moving activities. Oftentimes, the earth moving involves a haul road crossing a public highway, at which point a flagger station is generally set up. In order to assure the safest possible conditions at this type of location, it is advisable to supplement the warning devices (used in advance of the crossing) with floodlighting of the flagger station and the crossing site. Care is required in order to adequately illuminate the desired area without creating glare in the eyes of drivers on the highway. The adequacy of the floodlight placement can best be determined by driving through and observing the floodlighted area from each direction on the highway.

Maintenance activities on urban freeways, with high volume, high density traffic conditions, are frequently required to be conducted during nighttime periods (with low traffic volumes). Good floodlighting of the work site is a necessity because the workers need to see what they are doing and because the workers and the worksite need to be seen by passing drivers. The lighting units should be positioned so they do not cause glare to drivers on the highway.

### 6E-3 Hazard Identification Beacons (Flashing Electric Lights)

A Hazard Identification Beacon is a flashing yellow signal light (minimum diameter 8 inches) used at points of special hazard as a means of calling drivers' attention to these locations. When used, the flashing beacon should operate 24 hours a day.

On construction projects, because of the time and effort required to install and put these units into operation, they are used, generally, only at locations where frequent changes would not be required.

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On projects where an existing dual highway is being upgraded to freeway standards (which requires the use of crossovers to permit stage construction) flashing beacons have been used effectively to call drivers' attention to the hazard created by the necessary channelizing devices. Similarly, the temporary terminus of a freeway (where all traffic is channelized into an exit) is a location where beacons have informed drivers of the speed reduction necessary in transitioning from freeway to local road operations.

Hazard Identification Beacons may be rated singly or in groups containing more than one unit.

During normal daytime maintenance operations, the functions of flashing beacons are adequately provided for by the lighting equipment on maintenance vehicles, either the emergency flashers, the rotating dome light, or both. However, at locations where the daytime maintenance activity requires an obstruction to remain in the roadway at night, flashing beacons may be installed at the point of hazard. At locations where vandalism is no problem, the power may be provided by a portable electric generator. (See sec. 4E-5)

### 6E-4 Steady-Burning Electric Lamps

As used herein, steady-burning electric lamps shall mean a series of low wattage yellow electric lamps. They may be used to mark obstructions or hazards, but they are generally less effective than flashing lights for these uses because of the attention getting effect of the latter. However, where lights are needed to delineate the traveled way through and around obstructions in a construction or maintenance area, the delineation shall be accomplished by use of steady-burning lamps.

Steady-burning lamps, placed in a line on longitudinal barricades, have been effective in delineating the proper vehicle path through stage construction areas (which require changing patterns of traffic movement).

The application of these devices during maintenance activities is infrequent due to the generally short time nature of maintenance work. A type of maintenance activity where steady-burning lamps could be utilized is the removal and replacement of a portion of a bridge deck. The lamps could be mounted on barricades and effectively aid in channelizing traffic around the work area.

### 6E-5 Warning Lights

As used herein, Warning Lights are portable, lens directed, enclosed lights. The color of the light emitted shall be yellow. They may be used in either a steady-burn or flashing mode. Warning lights shall be in accordance with the current ITE Purchase Specifications for Flashing and Steady-Burn Warning Lights.

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Type A Low Intensity Flashing Warning lights are most commonly mounted on barricades, drums, vertical panels or advance warning signs and are intended to continually warn drivers that they are approaching or proceeding in a hazardous area.

Warning lights shall have a minimum mounting height of 36 inches to the bottom of the lens. Type B High Intensity Flashing Warning lights are normally mounted on the advance warning signs or on independent supports. Extremely hazardous site conditions within the construction area may require that the lights are effective in daylight as well as dark, they are designed to operate 24 hours per day.

Type C Steady-Burn lights are intended to be used to delineate the edge of the traveled way on detour curves, on lane changes, on lane closures and on other similar conditions. Their application shall be as indicated in section 6E-4.

The light weight and portability of warning lights are advantages that make these devices useful as supplements to the reflectorization on hazard warning devices. The flashing lights are effective in attracting a driver's attention and, therefore, provide an excellent means of identifying the hazard. Flashers shall not be used for delineation, as a series of flashers would tend to obscure the desired vehicle path.

Warning lights on barricades shall be installed to a minimum mounting height of 36 inches to the bottom of the lens.

Type A Low Intensity Flashing Warning Lights and Type C Steady Burn Warning Lights shall be maintained so as to be capable of being visible on a clear night from a distance of 3,000 feet. Type B High Intensity Flashing Warning Lights shall be maintained so as to be capable of being visible on a sunny day when viewed without the sun directly on or behind the device from a distance of 1,000 feet.

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### 6E-6 Special Lighting Units

Special lighting units, generally trailer-mounted for easy transport to a jobsite, have been developed to supplement conventional signs, pavement markings and lighting for maintenance activities. The flashing lights on the unit are operated from a self-contained power source mounted on the trailer, either batteries or an electric generator. A variety of light configurations are used for traffic warning and guidance.

Most units are designed with racks, channels or other devices so that signs may be displayed with messages appropriate to the particular kind of work being performed.

These special lighting units are used most frequently on high density urban freeways and are placed just in advance of the worksite. The flashing lights, together with appropriate signs, have proven to be very effective warning devices while also providing some physical protection to the maintenance workers.

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Although these special lighting units were developed to satisfy a need on urban freeways, they have many applications on all types of highways. Their mobility, together with the availability of flashing lights and/or a variety of sign messages makes them useful for almost any situation where conditions require extraordinary advance warning of the maintenance activities. If the units are to be used at night, consideration should be given to providing a means whereby the intensity of the flashers may be reduced during darkness when the lower intensities are desirable.

### 6E-7 Advance Warning Arrow Panel

Advance warning arrow panels are sign panels with a matrix of lights capable of either flashing or sequential displays. Advance Warning Arrow panels are intended to supplement other traffic control devices. Arrow panels will not solve difficult traffic problems by themselves, but they can be very effective when properly used to reinforce signs, barricades, cones, and other traffic control devices. Necessary signs, barricades, or other traffic control devices shall be used in conjunction with the advance warning arrow panel.

Arrow panels are effective in encouraging drivers to leave the closed lane sooner. Arrow panels provide additional advance warning and directional information where traffic must be shifted laterally along the roadway. They assist in diverting and controlling traffic around construction or maintenance activities being conducted on or adjacent to the traveled way and give drivers positive guidance about a roadway path diversion that they might not otherwise expect. VI-13 (c) Rev. 2

Arrow panels are generally used for day or night lane closures, roadway diversions, and slow-moving maintenance and construction activities on the traveled way. They are particulary effective under high-speed and high-density traffic conditions. At night, they are effective where other traffic control devices cannot provide adequate advance warning of a roadway path diversion. During daylight, arrow panels are effective under high-density traffic conditions that might block the driver's advanced view of construction or maintenance activities ahead.

### 6E-8 Advance Warning Arrow Panel Application

Placement of arrow panel should be varied as needed to achieve the desired recognition distances. Also, care must be taken in the placement to avoid driver confusion in the vicinity of ramps, median crossovers, and side road intersections.

For stationary lane closures, the arrow panel should be placed on the shoulder at the beginning of the taper, or where there are narrow shoulders, in the closed lane behind the channelizing devices on the same side of the lane closure. Placement at the start of the taper is preferred to placement in the middle of the taper.

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In diversions where arrow panel need has been determined, the arrow panel should be placed behind the barricades closing the roadway.

For moving-maintenance activities where a lane is closed, it is preferable that the arrow panel be placed at the rear of the activity in the closed lane on a vehicle separate from the maintenance vehicle itself. The arrow panel should always remain upstream of the maintenance vehicle where adequate recognition distance is available. The vehicle carrying the arrow panel should also be equipped with appropriate signing and/or lighting.

Generally arrow panels should not be used for shoulder or roadside work activities nor should they be used on two lane highways because the panels can cause unnecessary lane changing.

### 6E-9 Advance Warning Arrow Panel Specifications

Advance warning arrow panel shall meet the specifications of Table VI-3. The minimum legibility distance for various traffic conditions are based on the decision-sight distance concept. Minimum legibility distances are those at which the arrow panel message can be comprehended by a driver on a sunny day or clear night. Also shown are the arrow panel sizes needed to meet the legibility distance needs.

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Table VI-3

*Advance Warning Arrow Panels*

| *Type* | *Minimum Size* | *Minimum Number of Panel Lamps* | *Minimum Legibility Distance* |
|---|---|---|---|
| A | 24″ × 48″ | 12 | ½ mile |
| B | 30″ × 60″ | 13 | ¾ mile |
| C | 48″ × 96″ | 15 | 1 mile |

Type A advance warning arrow panels are appropriate for use on low speed urban streets. Type B are appropriate for intermediate speed facilities and for maintenance on moving operations on high-speed roadways. Type C arrow panels are intended to be used on high-speed, high-volume construction projects.

Arrow panels shall be rectangular, of solid construction, and finished with nonreflective flat black. The panels shall be mounted on vehicle, trailer, or other suitable support. Vehicle-mounted panels should be provided with remote controls. Minimum mounting height should be 7 feet above roadway to the bottom of the panel, except on vehicle mounted panels which should be as high as practicable.

Arrow panels should have the capability of the following mode selections: (1) left or right flashing or sequential arrows; or (2) left or right sequential chevrons; and (3) double flashing arrows; and (4) caution. The caution mode consists of four or more lamps, arranged in a pattern which will not indicate a direction.

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Arrow panels shall be capable of a minimum of 50 percent dimming from their rated lamp voltage. The flashing rate of the lamps shall not be less than 25 nor more than 40 flashers per minute.

Minimum lamp "on time" shall be 50 percent for the flashing arrow and 25 percent for the sequential chevron.

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The arrow panel lamps or lenses shall be recess mounted or, alternately equipped with an upper hood of not less than 180°, and the color of the light emitted shall be yellow.

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## E. CROSSING SUPERVISION

### 7E-1 Types of Crossing Supervision

There are two types of school crossing supervision:

1. Adult control of pedestrians and vehicles with adult guards or police officers.
2. Student control of only pedestrians with student patrols.

Recommended practices for the organization, operation and administration of an adult crossing guard program are given in Civilian Guards For School Crossings* and Adult School Crossing Guards.**

Recommended practices for the organization, administration and operation of a student patrol program are given in Policies and Practices for School Safety Patrols.**

### 7E-2 Adult Guards

Adult guards may be used to provide gaps in traffic at school crossings where an engineering study has shown that adequate gaps must be created (sec. 7A-3).

### 7E-3 Legal Authority for Adult Guards

Adult guards should be special police officers appointed by the local police agency.

The local police agency should be responsible for the selection, training and supervision of adult guards.

### 7E-4 Choice of Adult Guards

High standards for selection of adult guards are essential. Adult guards must understand children and in addition should possess the following qualifications:

1. Average intelligence
2. Good physical condition, including sight and hearing
3. Mental alertness
4. Neat appearance
5. Good character
6. Dependable
7. Sense of responsibility for safety of children.

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* Available from the Traffic Institute of Northwestern University, 405 Church St., Evanston, Illinois 60204.

** Available from the American Automobile Association, Falls Church, Va. 22042.

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### 7E-5 Uniform of Adult Guards

Adult guards should be uniformed so that motorists and pedestrians can recognize them and respond to their signals. It is recommended that their uniforms be distinctively different from those worn by regular police officers.

During periods of twilight or darkness, adult guards and student patrols should wear either reflective material or reflective clothing.

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### 7E-6 Operating Procedures for Adult Guards

Adult guards should not direct traffic in the usual police regulatory sense. In the control of traffic, they should pick opportune times to create a safe gap. At these times, their presence in the roadway serves as an easily recognized indication that pedestrians are about to use the crosswalk, and that all traffic must stop. Adult crossing guards may use an 18″ stop paddle, similar to the one set forth in section 6F-2, except that the paddle shall have "STOP" on one or both sides and that it shall be reflectorized or illuminated when used during hours of darkness. The legend shall be at least 6″ series capital letters. When all traffic has stopped, the adult guard allows the children to cross.

### 7E-7 Police Officers

Police officers should be used for school crossing supervision only in emergency situations on a temporary basis or at very hazardous school crossings where the use of adult guards is not feasible.

### 7E-8 Student Patrols

Student patrols may be used to direct and control children at crossings near schools where there is no need to create adequate gaps in traffic.

Student patrols may be used to direct and control children at signalized intersections where turning movements are not a problem, and to assist adult guards in the control of children at crossing locations used by large numbers of children.

Student patrols should not be responsible for directing vehicular traffic. They should not function as police.

### 7E-9 Legal Authority for Student Patrols

Student patrols should be authorized by the local school board. School authorities should be responsible for organizing, instructing and supervising patrols with the assistance of the local police.

### 7E-10 Choice of Student Patrols

Student patrols should be carefully selected. They should be children from the 5th grade or higher. Leadership and reliability should be determining qualities for patrol membership.

Parental approval should be obtained in writing before a child is used as a member of a student patrol.

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lenses of the Speed Limit Sign Beacon may be positioned within the face of the School Speed Limit sign.

Because of special features, it may not always be practical to make variable display signs conform in all respects to the accepted standards. However, during the periods the school speed limit is in force, their basic shape, message, legend layout, and colors should conform to the standard for the fixed message sign, except that if the sign is internally illuminated, it may have a white legend on a black background.

School Speed Limit
Sign Assembly

Possible Sign
With Speed Limit
Sign Beacon

Variable display signs with flashing beacons should be used for the more critical situations, where greater emphasis of the special school speed limit is needed.

Where practical, consideration should be given to including, on the back of variable display signs, a light or device to indicate the speed limit message is in operation or visible.

The end of an authorized and posted school speed zone shall be marked with a standard Speed Limit sign showing the speed limit for the section of highway which follows or with an END SCHOOL ZONE sign.

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### 7B-13 Parking and Stopping Signs (R7 Series)

Parking signs and other signs governing the stopping and standing of vehicles in school areas cover a very wide variety of regulations and only general specifications can be laid down here. Typical examples are as follows:

1. No Parking 8:00 AM to 5:00 PM School Days Only.
2. No Stopping 8:00 AM to 5:00 PM School Days Only.
3. 5 Min. Loading 8:00 AM to 5:00 PM School Days Only.

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The legend on parking signs shall state whatever regulations apply, but the signs shall conform to the standards of shape, color, position and use. Generally, parking signs should display such of the following information as is appropriate, from top to bottom of the sign, in the order listed:

1. Restriction or prohibition.
2. Time of day it is applicable, if not at all hours.
3. Days of week applicable, if not every day.

In addition, there should be a singled-headed arrow pointing in the direction the regulation is in effect (if the sign is at the end of a zone) or a double-headed arrow pointing both ways (if the sign is at an intermediate point in the zone). As an alternate to the arrow (if the signs are posted facing traffic at an angle of 90 degrees to the curb line) there may be included on the sign, or on a separate plate below the sign, such legend as BEGIN, END, HERE TO CORNER, HERE TO ALLEY, THIS SIDE OF SIGN, or BETWEEN SIGNS.

Where parking is prohibited at all times or at specified times, parking signs shall have red letters and border on a white background (Parking Prohibition signs); and where only limited-time parking is permitted, or where parking is permitted only in a particular manner, the signs shall have green letters and border (Parking Restriction signs).

For emphasis the word NO or the numeral showing the time limit in hours or minutes may be in a reversed color arrangement in the upper left-hand corner of the sign, i.e., in white on a rectangular area of red or green.

The No Parking symbol (shown in sign R8-3a) may be used as an alternative to the words NO PARKING on signs R7-1, R7-2, R7-3, R7-6, R7-7, and R7-107a. When the symbol sign itself (R8-3a) is used for urban applications, it shall have a minimum and standard size of 12 inches square. The symbol "P" is black, circumscribed in a red circle with a red slash on a white background and black border.

The supplemental educational plaque, NO PARKING, with a red legend and border on a white background, may be used above the symbol.

Parking signs shall have a standard size of 12 inches by 18 inches. If arrows are used to indicate the extent of the restricted zone, the signs should be set at an angle of not less than 30 degrees nor more than 45 degrees with the line of traffic flow to be visible to approaching traffic. If word legends on a separate panel are used to indicate the extent of the restricted zone, the signs should be posted facing traffic at an angle of 90 degrees to the curb line.

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### 7E-11 Operating Procedures for Student Patrols

Student patrols control children, not vehicles. They should stop children back of the curb or edge of the roadway and allow them to cross only when there is an adequate gap in traffic. Flagging devices used during periods of twilight or darkness shall be reflective or illuminated. VII-45 (c) Rev. 3

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